



CHILE

SELECTED ISSUES

January 2023

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CHILE

SELECTED ISSUES

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Approved By
**Western Hemisphere
Department**

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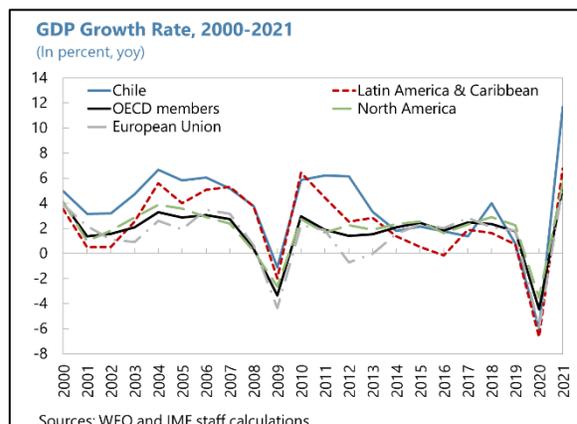
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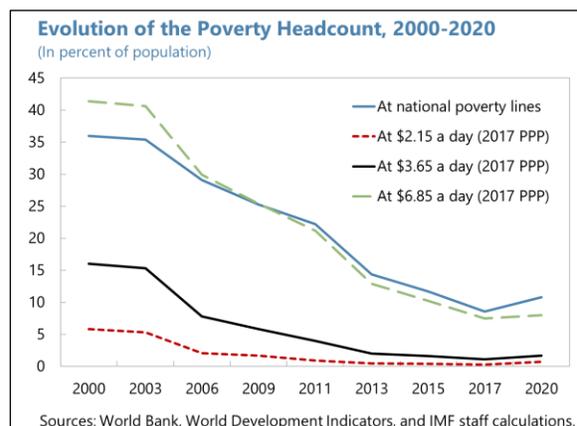
TAX REFORM SCENARIOS IN INTERNATIONAL PERSPECTIVE¹

A. Introduction

1. Over the last decades, Chile has achieved strong economic growth, while making progress on poverty reduction. Strong growth has been underpinned by macroeconomic stability, very robust macroeconomic policies, and very strong institutional policy frameworks. The average GDP growth rate over the last two decades in Chile (3.7 percent) has been significantly above the Latin American and Caribbean (LAC) (2.3 percent) and the OECD (1.8 percent) averages.



2. Strong growth translated into a rapid reduction in poverty rates and better living conditions for large segments of the population. The poverty headcount dropped from around 35 percent in 2000 to slightly above 10 percent in 2019. Extreme poverty appears to have been virtually eliminated. Hadzi-Vaskov and Ricci (2021) further show that since at least 2005, the share of vulnerable population declined significantly in Chile, while it remained roughly constant in LAC as a whole. Similarly, they show that Chile had the largest share of vulnerable population among LAC economies in 2005-2008 but reached one of the lowest shares in 2015-2018. These trends coincide with a steady increase in social spending, both as a share of total government expenditure and as a share of GDP.

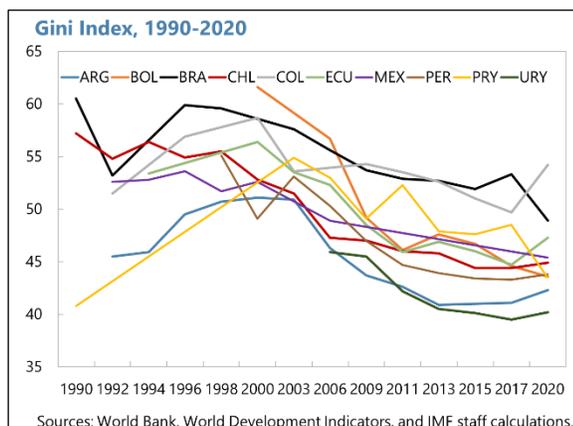


3. While the economic and social outcomes achieved by Chile have been impressive, important social challenges lie ahead. In 2019, the country experienced unprecedented social unrest that had a long-lasting social and economic impact and ignited a process to reform the constitution (see Box 1 of Chile: Staff Report for the 2022 Article IV Consultation). Social demands were wide ranging, but a common thread was the perception of increased inequality, lack of access

¹ Prepared By Eduardo Camero (FAD)

to the economic benefits of macroeconomic stability, and rising cost of living. Hadzi-Vaskov and Ricci (2021) suggest the following main reasons may explain the unrest in Chile:

- **Income inequality.** Although income inequality declined steadily since 1990, it remains one of the highest in the world, even when comparing with countries at similar development level.
- **Perceived inequality.** Chile has the largest gap between perceived and actual inequality in the group of Latin American countries. Interestingly, in Chile perceived inequality increased while inequality measured by the Gini coefficient declined.



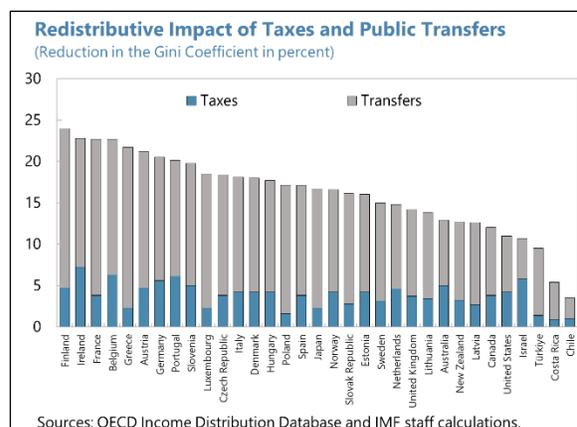
- **Inequality of opportunity.** Consistent with persistently high income inequality, Chile has relatively low earnings and social mobility.
- **Inequality of access to essential services:**
 - *High out-of-pocket health expenses.* Households' out-of-pocket health payments in Chile have been at the top within OECD countries and at the very top among countries at similar level of development.
 - *Inadequate pensions.* Replacement rates in Chile are low within the OECD, even more so for women. There are many reasons that contribute to such an outcome, including low contribution rates, poor contribution density, under-reporting, and low retirement ages.
 - *Decreasing returns to education.* Despite spending per student being in line with international benchmarks, the quality of education in Chile is relatively low compared to the OECD (but high compared to regional peers). Furthermore, returns to schooling and the education premium have decreased in Chile, which might have led to unmet expectations of young graduates, creating frustration and social discontent.

4. Addressing social challenges will require a new landscape for public finances that must be balanced with fiscal sustainability. The authorities remain committed to reducing the structural fiscal deficit to broadly balance over the medium term (from a deficit target of 2.1 percent in the 2023 Budget) and stabilizing gross public debt below 45 percent of GDP, which they consider a prudent debt level.

5. The government has embarked on an ambitious tax and expenditure reform agenda. A comprehensive tax reform under discussion in Congress aims to gradually raise net revenues by about 3.5 percent of GDP by 2026. Plans to address social needs are also expected to be

comprehensive, covering education, health and housing, dependent care, and pensions. A pension reform proposal was submitted to Congress in November, while other reforms are expected to be submitted in the period ahead.

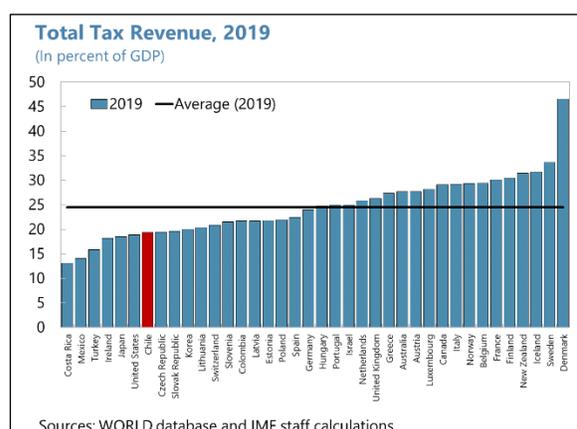
6. An adequate tax and spending strategy can foster both inclusion and growth. It can also mitigate risks of social unrest that can have non-linear and lasting effects on economic growth. In other OECD countries, the fiscal system can significantly reduce income inequality; countries like Finland, Ireland or France achieve a reduction of the Gini coefficient of more than 20 points, mostly via the effect of transfers. The redistributive effect of the fiscal system in Chile remains the lowest in the OECD, accounting for less than 5 points of the Gini coefficient (3 points from transfers and 2 points from taxes).



7. Against this background, this paper benchmarks the estimated revenue gains of the tax reform proposal and discusses different fiscal consolidation scenarios. The paper is organized as follows. Section B presents the stylized facts of the tax system in Chile compared with OECD countries. Following a very brief overview of the tax reform proposal, section D presents a benchmark analysis of the estimated revenue yields against similar domestic revenue mobilization episodes in OECD countries. Section E brings the analysis together under scenarios for fiscal consolidation and fiscal space for increasing social spending in Chile. The last section concludes.

B. Stylized Facts of the Tax System in Chile

8. Chile's tax revenue collection is relatively low compared to OECD countries. Over the last decade, total tax revenue² in Chile hovered between 18 and 20 percent of GDP. In 2019, before the pandemic, tax revenue reached 19.4 percent of GDP, only above Costa Rica, Mexico, Turkey, Ireland, Japan, and the United States. To reach the (simple) OECD average, tax revenues would need to increase by around 5 percent of GDP (and would reach a level similar to Germany, Portugal, or the Netherlands). To get to

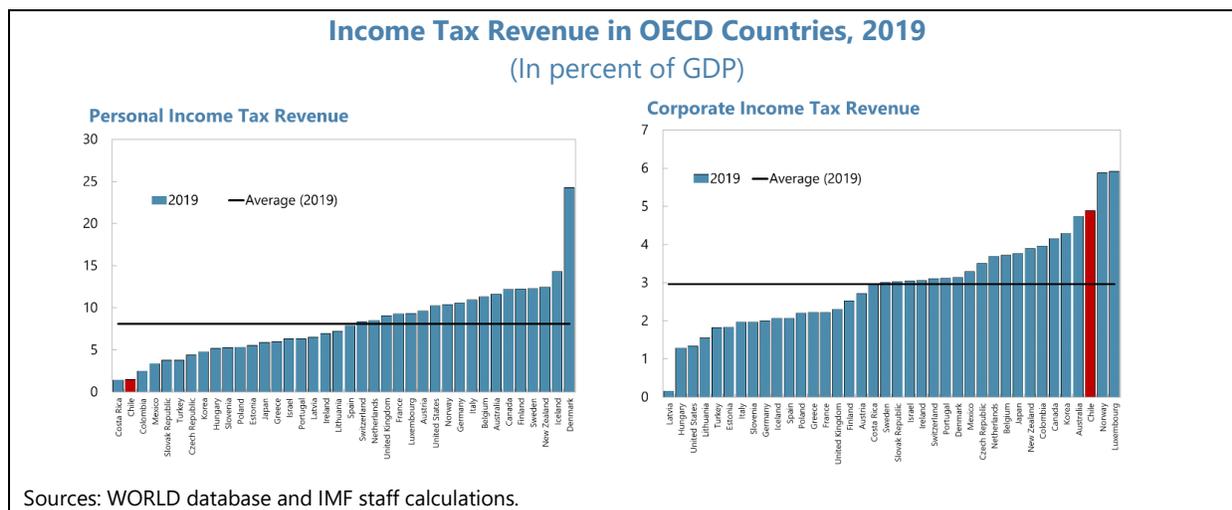


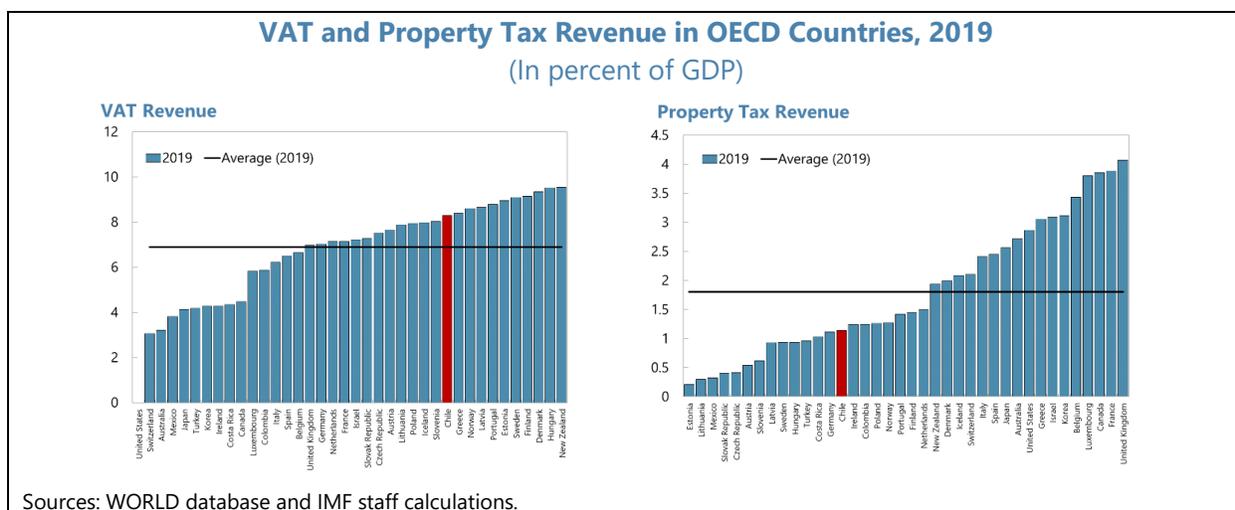
² Total tax revenue is taken from the IMF World Revenue Longitudinal Database (which prioritizes data from the OECD Global Revenue Statistics Database for OECD countries) and includes all major taxes, such as on personal and corporate income, goods and services (including value added), property, payroll, trade, and other or unidentified. It does not include social security contributions.

the average of the second quartile of OECD countries, tax revenues would have to increase by 2.4 percent of GDP.

9. The very weak performance of personal income tax (PIT) collections contrasts with above average revenues from the corporate income tax (CIT). The PIT collects only 1.5 percent of GDP (a tad above Costa Rica), 6.6 percentage points of GDP below the OECD average. The low performance of PIT is likely due to the very high exempt tax threshold—equivalent to 80 percent of Chile’s per capita GDP—and leading to only about 25 percent of registered taxpayers with income above the threshold. In addition, PIT tax rates for low and middle brackets are modest, and only increase significantly for the highest brackets. On the other hand, the performance of CIT in Chile is amongst the strongest in the OECD (4.9 percent of GDP, about 1.9 percentage points higher than the OECD average).

10. VAT collections are also above the OECD average, while excise and property taxes are below average. Revenue from VAT (8.3 percent of GDP) is higher than the OECD average (6.9 percent of GDP). On the other hand, property taxes in Chile generate 1.1 percent of GDP, almost 0.7 percent of GDP less than the average for the OECD (1.8 percent of GDP). From excise taxes (not shown), Chile collects 1.5 percent of GDP, almost one percent of GDP less than the average for the OECD (2.4 percent of GDP), which might reflect, among other things, relatively low taxation of diesel in Chile.





C. Main Elements of the Authorities' Tax Reform Plan

11. The tax reform plan unveiled in June 2022, and currently under discussion in Congress, is ambitious and comprehensive. It pursues worthwhile goals, including raising revenues for an expansion of social services; increasing the progressivity of the tax system; simplifying and lowering compliance costs; reducing incentives for aggressive tax planning; and fostering a green economy.

12. The most important elements include:³

- A move from semi-integrated income taxation to a dual system, with a new tax on capital income.
- A broadening of the tax net to retained profits, via a tax on retained earnings for firms with a majority of revenues from passive sources.
- A more progressive PIT (but with additional deductions for rental and dependent-care expenses).
- A new wealth tax.
- A lower CIT rate from 27 to 25 percent (but only if a comparable amount is spent on productivity-boosting investments).

Estimated Revenue Yields from Proposed Tax Changes (In percent of GDP)				
	2023	2024	2025	2026
Income taxes	0.2	0.6	0.7	0.8
Wealth	0.0	0.3	0.4	0.4
Reduction of exemptions'	0.0	0.0	0.0	0.2
Tax administration	0.4	0.8	1.2	1.6
Royalty	0.0	0.1	0.5	0.5
Corrective taxes	0.0	0.0	0.1	0.3
Total increase in revenues	0.6	1.8	3.0	3.8
Tax expenditures	0.0	-0.4	-0.3	-0.3
Net increase in revenues	0.6	1.4	2.7	3.5
Differences with original proposal	0.0	-0.5	-0.5	-0.6

Sources: Ministry of Finance and IMF staff estimates.

³ See also Annex IX in Chile Staff Report for the 2022 Article IV Consultation.

- Tax administration measures to reduce tax evasion and elusion (including a new anti-avoidance rule, a fiscal whistleblower program, more relaxed banking-secret restrictions vis-à-vis the tax authority, and more stringent transfer pricing regulations, among others).
- Modifications to mining taxes, e.g., the introduction of a moderate ad-valorem royalty and higher rates of the current special mining tax.

D. Benchmarking the Tax Reform Proposal in International Perspective

13. This section benchmarks Chile’s tax reform plan, focused on the direct tax components, against similar episodes of domestic revenue mobilization in the OECD.

Following the methodology in Akitoby and others (2018), a simple comparative exercise is undertaken for OECD countries that underwent revenue mobilization episodes that were similar in terms of revenue yields and duration to that of Chile’s plan. This methodology consists of:

- Data on tax revenues as a percent of GDP are assembled for 2000–2019 for all OECD countries from the WORLD database.⁴
- For different combinations of tax handles, an “episode” is identified as a (continuous) four-year window for a given country during which the yearly tax-to-GDP ratio grew on average by the same amount as in the tax reform under discussion in Chile (for the same combination of taxes).⁵
- For each episode identified, three attributes are calculated:
 - Duration, defined as the number of consecutive years in which the tax-to-GDP ratio is increasing.
 - Yield, defined as the accumulated increase in the tax-to-GDP ratio.
 - Sustainability, defined as whether the tax-to-GDP ratio does not go back to its initial (or lower) level in the four-year window immediately after the episode ends.
- Of all combinations of tax handles,⁶ the most amenable to international benchmarking is the direct taxes component.

⁴ Although data is available for 2020 (and in some cases for 2021), they are likely to be affected by the COVID-19 pandemic and are not included in the sample.

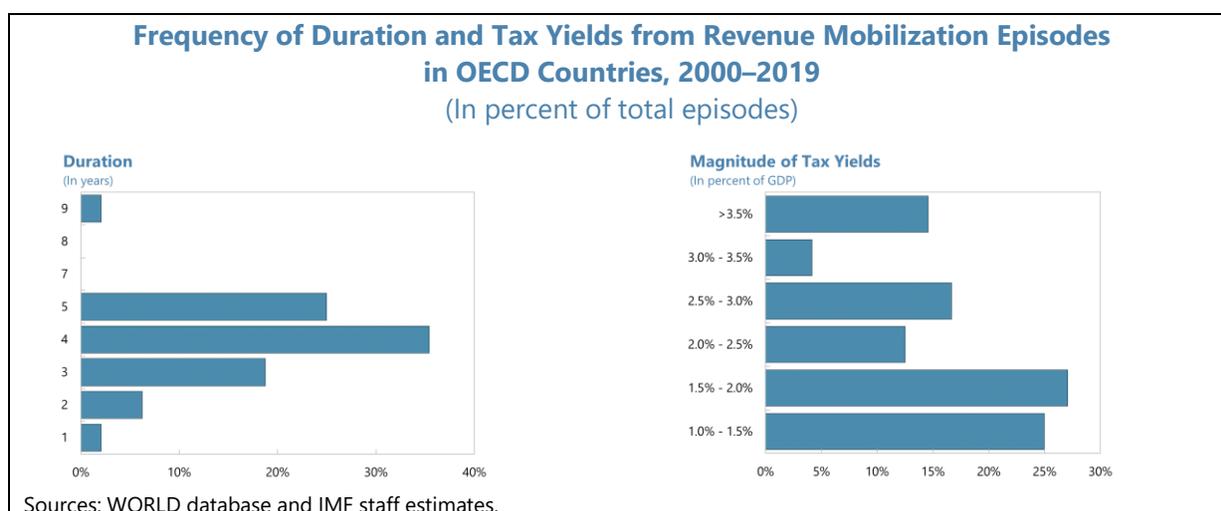
⁵ In addition, an episode must start with a positive increase in the tax-to-GDP ratio.

⁶ Revenues from mining do not necessarily have a direct relationship to GDP, as do tax revenues, so they are better assessed on a project-by-project basis. *Corrective*, or excise taxes, can be relatively well estimated using the characteristics of the tax (i.e., for the carbon tax, the amount per ton of carbon content in a fuel), the consumption of the excisable good (i.e., consumption of fossil fuels), and the behavioral response (i.e., the price elasticity of consumption of fossil fuels), so there is less need to do an international benchmarking. See 2022 Selected Issues Paper *Climate Policies for a Successful Green Transition* for an assessment of revenue increases from green taxes and other climate policies.

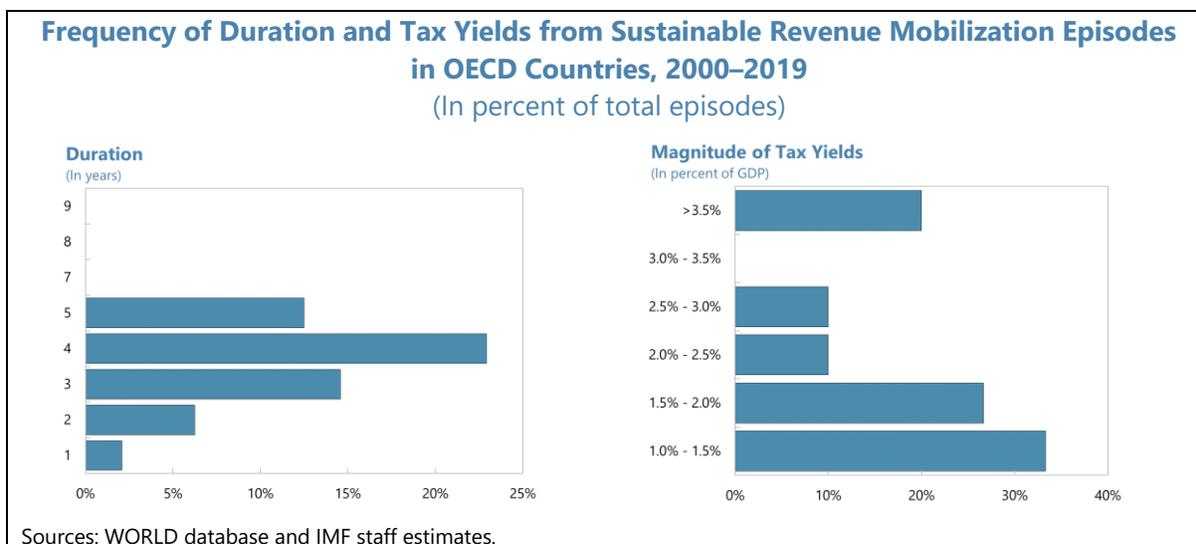
- For the tax reform proposal in Chile, this includes measures on PIT, CIT, and wealth taxes, including tax expenditures and reduction of exemptions. In terms of the comparison group of OECD countries, the exercise includes PIT, CIT, and property taxes.
- The effect of tax administration measures is difficult to assess, so the exercise is done both with and without them.
- The direct tax component of the tax reform assumes a yield in year four of:
 - 2.7 percent of GDP (0.68 per year on average) with tax administration measures.
 - 1.1 percent of GDP (0.28 per year on average) without those measures.
- A robustness check is made using data from 1990 to 1999 to assess whether OECD countries did more intensive revenue mobilization earlier in their development phase.
- In addition, the identified episodes are correlated with instances of recorded tax reforms on CIT, PIT and property taxes using the IMF Tax Measures Database. A large majority of the episodes indeed coincide with episodes of tax reforms, which gives a degree of confidence on the analysis. However, the country coverage of the Tax Measures Database is less comprehensive (Akitoby and others, 2018).

Benchmarking – Direct Taxes Excluding Tax Administration Measures

14. Excluding tax administration measures, increases of similar magnitude and duration as in Chile’s proposed reform of direct taxes have been relatively common in the OECD. For OECD countries, 48 similar episodes can be identified, in which the direct-tax-to-GDP ratio increased by 0.28 percentage points on average per year over a four-year period. In most of the episodes, direct tax revenues increased between 1 and 2 percent of GDP over 3 to 5 years, although in around 15 percent of cases the increase was larger than 3.5 percent. The average duration of episodes was 4.2 years, with an average yield of 2.2 percent of GDP.



15. Considering only sustainable episodes (as defined above), the number of similar episodes drops to 30. Of the remaining 18 episodes, 10 can be classified as non-sustainable (meaning that the direct-tax-to-GDP ratio decreased in the window immediately after the episode ended), and 9 episodes are indeterminate because they are too recent (i.e., the next window closes after 2020, which lies outside of the sample). This suggests that a substantial share of revenue mobilization episodes was not successful in the medium term. Although the average duration of the sustainable episodes was slightly lower, at 3.8 years, the average yield was similar to the average of the full sample.



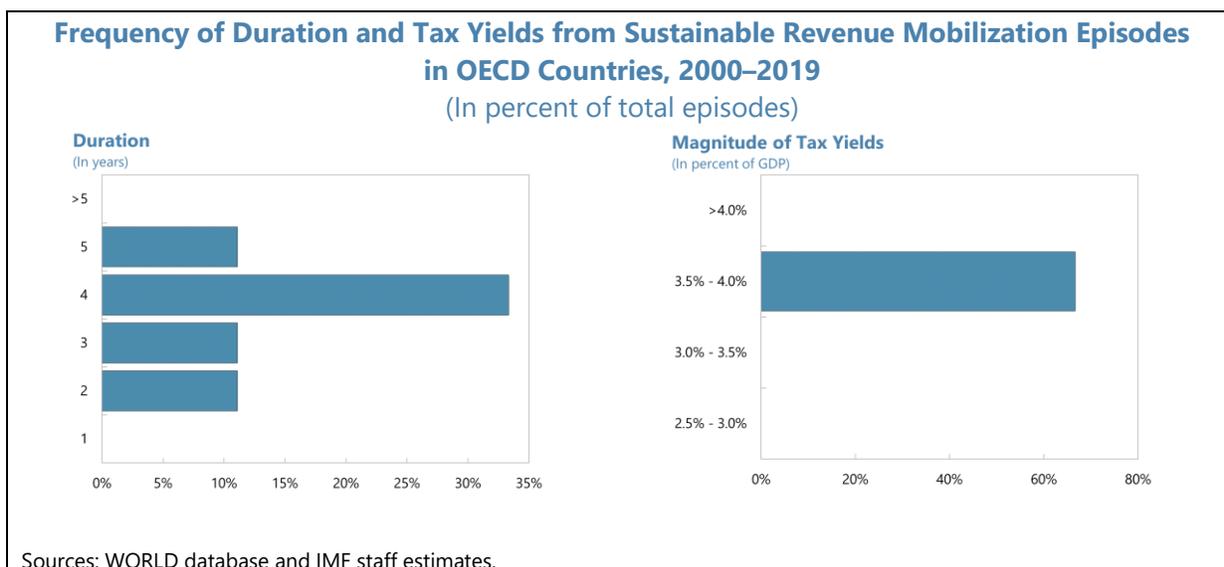
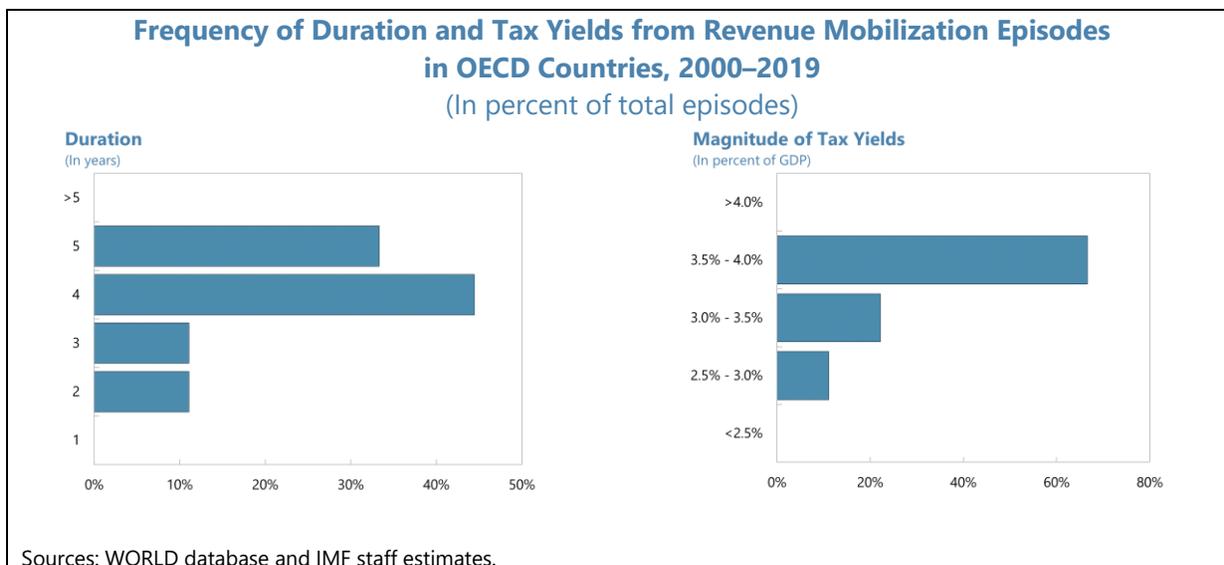
16. Including data from the decade of the 1990s adds 28 additional similar episodes. Interestingly, all but one episode for this decade are sustainable. Episodes are on average slightly shorter, but not significantly so (the simple average of duration is 3.9 years), and the average yield is 2.7 percent of GDP, 0.5 percentage points higher than in the original sample. As expected, both average duration and average yield remain unchanged.

Benchmarking – Direct Taxes Including Tax Administration Measures

17. Only 9 episodes are identified for OECD countries in which the direct-taxes-to-GDP ratio increased by at least 2.7 percentage points over the four-year period. Most of the duration of these episodes are between 4 and 5 years, and the yield is concentrated in the range between 3.5 and 4 percent of GDP. The average yield is 3.6 percent of GDP, and the average duration is 4 years.

18. Considering only sustainable episodes, the number of similar episodes is further reduced to 6. Most of the duration of these episodes are between 4 and 5 years (with the average duration at 3.7 years). All yields lie between 3.5 and 4 percent of GDP (with the average yield at 3.8 percent of GDP).

19. Similar to the results with the full sample, in the 1990s decade, the number of similar episodes is significantly reduced from 28 additional episodes to 8. These 8 episodes have an average duration of 3.9 years and an average yield of 4.3 percent of GDP, and all of them are classified as sustainable.



20. Measuring the yields of tax administration measures is particularly difficult. The benchmarking exercise does not speak to the feasibility of the revenue increases estimated from tax administration measures, but rather to the overall magnitude of the effects of all measures combined. Recent IMF research by Chang and others (2020 and 2022) suggest that a country with

stronger tax operational capacity collects significantly more tax revenues.⁷ They find that among tax administration characteristics, compliance risks management, use of third-party data, public accountability and transparency, the presence of a Large Taxpayer's Office, timely filing of tax declarations, and support for voluntary compliance play a significant role in increasing revenue. Akitoby and others (2018) also suggest that (i) multi-pronged tax administration reforms often go hand in hand with tax policy measures; and (ii) sustaining revenue gains hinges on efforts in the key compliance areas (risk-based audits, registration, filing, payment, and reporting). However, experience based on IMF Technical Assistance suggests that it is rare to see yields of over 0.5 percent of GDP from tax administration measures.

21. There are other downward risks to the revenue potential of the reform. The government's proposal rightly targets the highest wealth levels and a broad base of assets. However, the international experience shows that wealth taxes have been difficult to implement and have traditionally underperformed in revenue potential. An alternative would be to consider increasing property taxation, including by ensuring that property values are properly assessed and frequently updated. The reform proposal also includes various tax incentives to CIT. For instance, companies can credit up to two percentage points of CIT with *productive* investments. Revenue estimates in the tax plan assume firms will only use half of the credit, but it can be expected instead that firms will try to use as much as possible of the tax credit. These incentives should be regularly assessed and, if found not to be cost-effective, phased out.

22. Over the medium term, additional tax policy measures can be considered to mobilize revenues and further increase the progressivity and fairness of the tax system in Chile. The pillar on green taxes (forthcoming) has a strong potential not only to deliver on the authorities' ambitious and worthwhile climate goals, but also to increase revenues. Revenue collection (of up to 2 percent of GDP by 2030) can be recycled for targeted transfers and investment to protect the most vulnerable households and boost potential growth (see 2022 Selected Issues Paper on *Climate Policies for a Successful Green Transition*). On PIT, gradually lowering the exempt threshold could significantly increase the coverage of the tax, while still protecting poorer households. Discussions are also ongoing to modify mining taxes, which are a significant source of income (see Box 1).

E. Revenue Scenarios and Fiscal Consolidation

23. The authorities are firmly committed to their medium-term fiscal consolidation plan. The plan aims to achieve a broadly balanced structural fiscal position and keep public debt below 45 percent of GDP over the medium term. This entails a structural fiscal consolidation effort of around 2.1 percent of GDP from the 2023 structural Budget target.⁸

⁷ Those results are not directly applicable to the benchmarking exercise, as they estimate the effects of stronger tax administration on total tax revenue, including most importantly VAT revenue. In addition, Chile already has a mature tax authority, and VAT revenues are high.

⁸ The consolidation effort on the basis of the headline fiscal balance is closer to 3 percent of GDP.

Authorities' Medium-Term Fiscal Consolidation Plan					
(In percent of GDP)					
	2023	2024	2025	2026	2027
Cyclically adjusted Fiscal Balance	-2.1	-1.8	-1.1	0.3	0.0

Source: Ministry of Finance, *Informe de Finanzas Públicas*, 2022Q3.

Box 1. Mining Taxes

IMF Technical Assistance assessed that, relative to other mining fiscal regimes, the government take in Chile is in the middle to lower half of the distribution across countries. Moreover, the low break-even price contributes to a competitive investment climate, with the government take increasing with profitability. Among other factors, high copper prices and the potential for a significant and sustained increase in demand for copper in the medium term due to the global energy transition has led to discussions on the need for the mining sector to increase its fiscal revenue contributions.

After a protracted debate in Congress, a new proposal for changes to mining taxes was announced at the end of October. The project includes introducing an ad-valorem royalty, with a flat structure at a moderate rate of 1 percent. A simple and moderate royalty can ensure that the government receives early and dependable revenues. The profits-based component (*Impuesto Específico a la Minería*) maintains the current structure, with the rate of the tax increasing as the operating margin increases, but with higher marginal tax rates. This structure is attractive for investors because they will only pay more when their profits are higher; in other words, it is a progressive fiscal element.

24. The tax reform is needed to finance social spending and meet the authorities' fiscal consolidation plan. The tax reform aims to finance additional social spending, which lags behind OECD peers (Box 2). The universal minimum pension (PGU) approved in March 2022 entails additional net spending of about 0.8 percent of GDP per year,⁹ while the expansion proposed in the draft pension reform would cost an estimated extra 0.44 percent of GDP.¹⁰ Assuming the total tax reform yields the increase in revenues projected by the authorities, the increase in fiscal space would be around 1.4 percent of GDP (Column 1, next table), which would be sufficient to finance the proposed expansion of the PGU. Assuming a more conservative (but still ambitious) yield from tax administration measures, the increase in fiscal space declines to 1.0 percent of GDP (Column 2, next table). However, assuming a yield from tax administration measures commensurate with international experience as reported by IMF Technical Assistance (of 0.4 percent of GDP), additional expenditure rationalization or revenue mobilization measures would need to be identified to achieve the full fiscal consolidation and finance the proposed expansion of the PGU (Column 3, next table).

⁹ The PGU entails additional spending of 2.2 percent of GDP, financed by a rationalization of tax exemptions introduced in 2022 (0.6 percent of GDP) and the discontinuation of the solidarity pension (1.1 percent of GDP). The expansion proposed in the draft pension reform would cost an estimated 0.44 percent of GDP per year.

¹⁰ The additional spending in the PGU estimated in the financial report that accompanies the pension reform ("Informe Financiero No.201/07.11.2022", table 14, page 29) is 1,531 billion CHP (in real 2022 CHP) for 2027. Assuming the same inflation rate and GDP path as in the macroeconomic framework for the 2023 Budget, the estimated cost is about 0.44 percent of GDP.

Revenue and Fiscal Consolidation Scenarios			
(In percent of GDP)			
	Authorities' tax reform scenario (1)	Conservative tax administration yield (2)	Realistic tax administration yield (3)
Structural fiscal consolidation effort in authorities' medium-term plan	2.1	2.1	2.1
Revenues	3.5	3.1	2.5
<i>Of which:</i>			
Direct taxes	1.1	1.1	1.1
<i>Tax administration</i>	1.6	1.1	0.5
Royalty	0.5	0.5	0.5
Corrective taxes	0.3	0.3	0.3
Additional spending consistent with fiscal consolidation	1.4	1.0	0.4
<i>Of which:</i>			
PGU approved in March	0.8	0.8	0.8
PGU proposed expansion	0.44	0.44	0.44
Net effect of all tax measures and expansion of PGU	0.16	-0.24	-0.84
Sources: Ministry of Finance and IMF staff estimates.			

25. It is also important to consider that the increase in taxes will have implications for growth, with the effect depending on the final composition of the tax and spending reforms.¹¹ Empirical studies have generally found that CIT and PIT are relatively more harmful for growth than consumption and property taxes. Acosta and Yoo (2012) and De Mooj and others (2020) find that raising taxes on income, while reducing consumption and property taxes and keeping the overall tax burden unchanged, is negatively associated with growth. At the same time, income taxes tend to reduce inequality more than consumption taxes. This suggests a trade-off between growth and equity in choosing the tax composition, even before considering the effects of additional spending. Empirical evidence suggests that public spending in R&D and in education can boost investment and innovation, leading to higher growth. Martínez and others (2017) find that, using household-level data for Chile, social spending on basic and secondary education and health lead to lower inequality and poverty. Candia and Engel (2018), using similar data, find that transfers in education, specially at the primary and secondary levels, and in health reduce inequality.

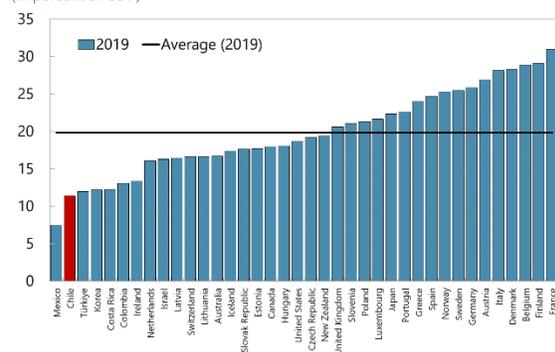
¹¹ The Ministry of Finance estimates the tax and spending reform could increase GDP per capita by 1.8 percent over the medium term, with a negative effect of 2.7 percent from higher taxes and a significant and positive effect of 4.5 percent from additional social and other spending.

Box 2. Social Spending in Chile and OECD Countries

Total social spending in Chile lags OECD countries. Using data for 2017 (the latest available year), total social spending in Chile was below the OECD average by more than 8 percent of GDP. Spending in pensions (considering both public and private mandatory spending) was in 2017 almost 4 percent of GDP below the OECD average, while total spending in health was 0.7 percent of GDP below (these figures are before the increases in the PGU and the draft pension reform).

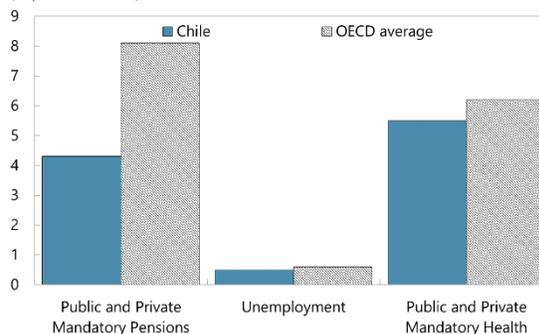
Total Public Social Expenditure, 2019

(In percent of GDP)



Social Spending, 2017

(In percent of GDP)



Sources: OECD Social Expenditure database, and IMF staff estimates.

F. Conclusions

26. The tax reform is needed to finance fiscal consolidation and increase social spending, but the expected revenue yields are subject to a high degree of uncertainty. The tax reform is ambitious, wide-ranging, and targeted at increasing progressivity and reducing inequality. Benchmarking the expected yields against similar episodes in OECD countries suggests that increasing revenues by 2.7 percent of GDP over four years from direct taxes (PIT, CIT, and property taxes) is feasible, but rare. The target for direct taxes, without including gains from tax administration, seems feasible based on many similar episodes in the OECD.

27. Including the effects of tax administration measures significantly reduces the number of comparable episodes in the international benchmarking exercise. In addition, IMF Technical Assistance experience suggests that tax administration reforms only occasionally yield more than 0.5 percent of GDP, although the exact yield depends on the specific measures and the capacity of the tax administration. Experience with wealth taxes suggests that they have frequently underperformed in terms of collection and have been scaled down or eliminated in some countries. In addition, tax expenditures might materialize with a high probability, so their cost-effectiveness should be regularly analyzed.

28. Sequencing social spending reforms conditional on revenue performance will be key to maintaining sustainability while boosting inclusive growth. Social spending and spending on innovation-boosting measures could counter the negative impact of higher taxes on growth. An adequate tax and social spending strategy will also foster inclusive growth by lowering risks of social unrest that are not captured in standard growth models. However, the uncertainty of revenue yields,

particularly from tax administration and wealth taxes, suggests that spending reforms should be sequenced to maintain fiscal sustainability. Under a realistic scenario on the yield from tax administration measures, additional revenue or spending measures would be needed to both meet fiscal consolidation goals and finance the expansion of the PGU.

29. Future tax reform efforts could focus on boosting revenue and further increasing the progressivity and fairness of the tax system. Consideration should be given to gradually increasing the carbon tax and the excise tax on diesel, lowering the exempt threshold of the PIT to bring more taxpayers in the tax net, and increasing the efficiency of property taxes by ensuring fiscal valuation accurately reflects property values, among other measures.

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MACROECONOMIC IMPLICATIONS OF PENSION FUNDS AND CAPITAL MARKETS¹

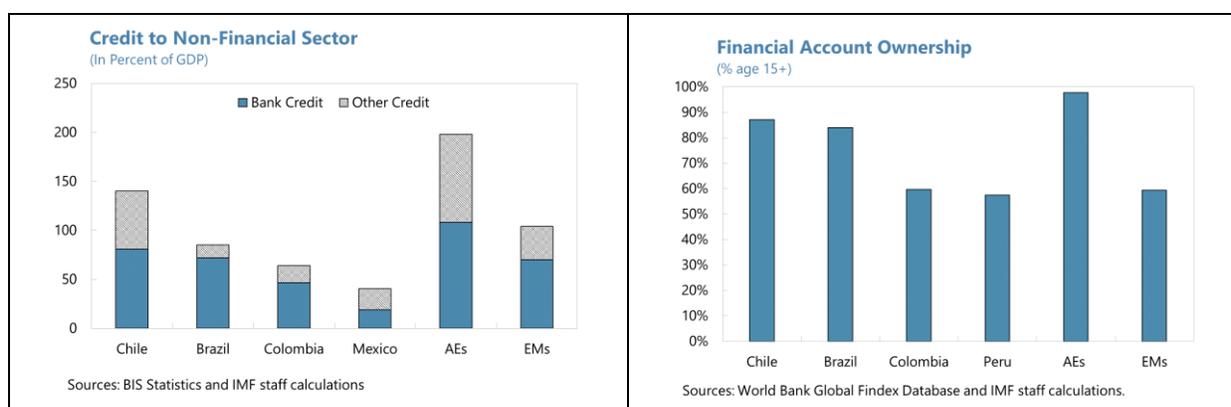
A. Introduction

1. Chile has one of the deepest and most sophisticated capital markets among emerging market economies. However, the three rounds of pension withdrawals approved during the COVID-19 pandemic have hurt the liquidity and depth of capital markets. In addition, possible future pension reforms may reshape the role that pension funds have played so far in the financial sector.

2. This paper investigates the macroeconomic implications of pension funds and capital markets. The paper (i) benchmarks Chile's capital markets against comparable countries; (ii) assesses the macroeconomic role pension funds have had in Chile and the impact of pension withdrawals approved in 2020 and 2021; and (iii) offers considerations for pension reform and other avenues that can foster capital market depth.

B. Institutional and Economic Factors Shaping the Development of Capital Markets

3. Chile has large and well-developed capital markets, ranking high among peer countries. This is reflected in the depth of the financial system, measured by the ratio of domestic credit to the private sector and individuals' access to financial accounts. Chile has a high level of credit to the non-financial private sector, not only from banks but also from non-bank sectors. Moreover, well-established financial institutions have promoted widespread access to financial services.

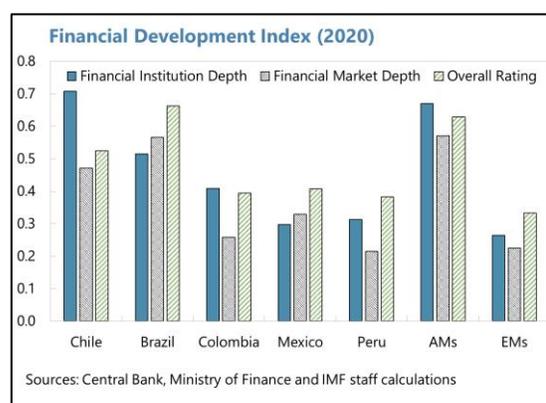


4. The literature identifies a number of factors linked to a country's capital market development. While there are many possible pathways, the literature broadly agrees on a set of economic and institutional features that are conducive to deep and developed capital markets: (i)

¹ Prepared By Chiara Fratto (WHD) and Junghwan Mok (MCM), with inputs from Antonio Gabriel (former IMF).

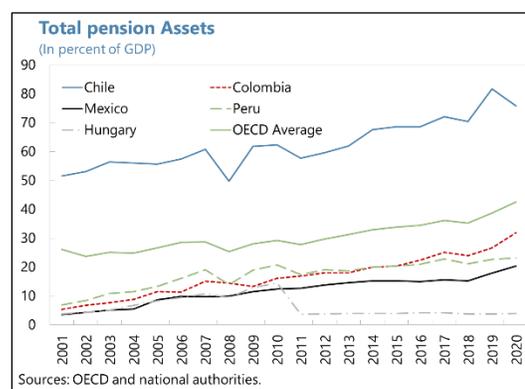
macroeconomic stability, in particular low and stable inflation; (ii) legal frameworks that foster transparency, competition, protection of property rights, bankruptcy regulation, investor protection rights, and sound financial regulation and supervision; (iii) the direct participation of institutional investors in financial markets, including the role of the state and public sector financial institutions; (iv) foreign participation in local currency bond markets; and (v) low cost of capital (Box 1).

5. Across all these dimensions, Chile ranks high among comparable countries, and the growth of financial institutions has been a key driver of financial development. Supported by a coherent and very strong institutional policy framework, Chile has maintained stable macroeconomic conditions over decades. The fully-fledged inflation-targeting monetary policy framework, combined with a floating exchange rate, has kept inflation low and stable. The authorities' continuous efforts to establish a strong regulatory framework are reflected in the active participation of foreign investors in the local market. The recent reform of the Banking Law empowered the Financial Markets Commission (CMF) to supervise and regulate financial institutions, including banks, insurance companies, and securities. The CMF has been proactively designing regulations to enhance financial stability as well as the financial environment, in cooperation with the Central Bank of Chile (BCCh) and the Ministry of Finance (IMF, 2021a). The IMF Financial Development Index shows that Chile has a higher level of financial institution depth than the average in advanced economies (Sahay et al., 2015).²



C. The Role of Pension Funds in Chile's Capital Markets

6. Pension funds in Chile are larger than in other countries. Chile's pension funds are important players in capital markets. Relative to the size of the economy, assets held by Chilean private pension funds (AFPs) are significantly larger than in other countries in Latin America and the OECD. Their size steadily increased in the last 20 years. Even after the large pension withdrawals, pension assets amounted to about 70 percent of GDP, well above the OECD average.



² The index reflects the ratio of private-sector credit, pension fund assets, mutual fund assets, and insurance premiums to GDP.

Box 1. Selected Country Experiences in Successful Capital Market Deepening 1/

Strategies for developing capital markets have evolved depending on countries' macro-financial environment. In many cases, a big push for reshaping the financial market structure has come with the need for reform after an economic downturn or financial crisis.



Korea. In the wake of the Asian Financial Crisis (AFC), the Korean government improved financial infrastructure and promoted advanced financial techniques to enhance the self-adjustment function of prices. This included the establishment of the primary dealer system and the Treasury bond future market, as well as the development of the inter-institutional repo market. Structural reforms, including transparent ownership structures and governance of institutions, led to financial soundness and better international credit standing of financial institutions, which helped to attract foreign investors. The larger inflow of foreign investment and the active investment by the National Pension Service and insurance firms also expanded the depth of the financial market.

Malaysia. Before the AFC, credit intermediation in Malaysia depended mostly on bank loans, accounting for 81 percent of financing to corporations. To diversify the source of funding, the authorities pushed forward an active agenda to develop an efficient and deep local currency bond market by establishing repo and derivatives markets. In addition, the sizable investment by the public Employees Provident Fund and insurance companies in the domestic market were followed by significant foreign participation.

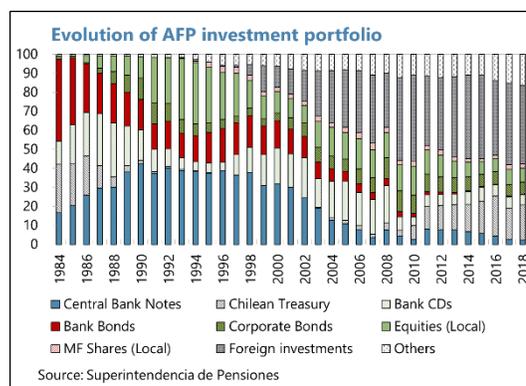
Poland. The underdeveloped banking system bequeathed by the socialist command society was a big structural challenge in the Polish financial market. Undercapitalization and poor loan portfolios of banks prompted the authorities to set up a program requiring banks to restructure credit portfolios and solve bad loan problems by themselves, not to create a moral hazard problem, while the government provided financial support. The scheme was a success, stabilizing banks and setting a stage for privatization, with foreign investors allowed to participate in the domestic banking sector. A carefully designed privatization process allowed banks time to build resilience to then benefit from the know-how of foreign investors and to develop their in-house advanced technologies.

1/ Based on Demekas and Nerlich (2020), BIS (2020), and Sahay et al. (2015).

7. Pension funds are deemed to have played a key role in the development of capital markets. The establishment of AFPs in Chile is associated with a remarkable increase in aggregate savings. They contributed to lower financing costs, provided a stable source of funding for long-term investment, and acted as shock absorbers in several episodes of capital outflows. Today, they continue to be key players, unparalleled in size when compared to other domestic investors or other countries.

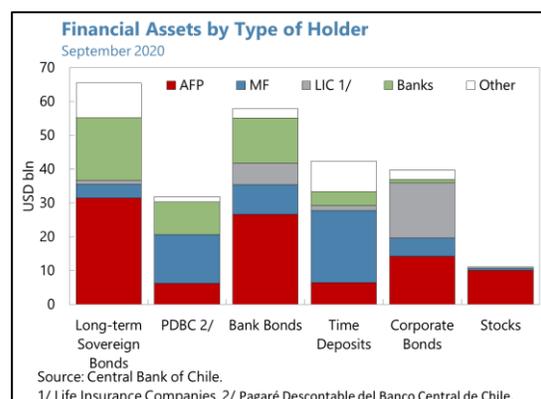
The Investment Strategy of Pension Funds Versus Other Investment Strategies

8. The progressive relaxation of AFP investment rules facilitated the availability of inexpensive long-term financing in the financial sector (Walker and Lefort, 2002). Since the creation of AFPs in 1981, investment rules have been progressively relaxed and AFPs have been allowed to invest in more asset classes, while ensuring adequate risk management. Initially, AFPs were only allowed to invest in fixed-income instruments. In 1985, investment in equities was allowed up to 30 percent of assets. In 1989 and 1990, AFP investment options were broadened to also include all types of publicly traded shares, mutual funds (MFs), and foreign fixed-income instruments. During the 1990s, investment limits abroad were also gradually relaxed. The reform in 2002 introduced five different types of funds, known as A through E, with varying degrees of exposure to variable-income assets. In 2008, the limits for AFPs to invest abroad were further relaxed, and pension funds were authorized to invest in derivative instruments.³



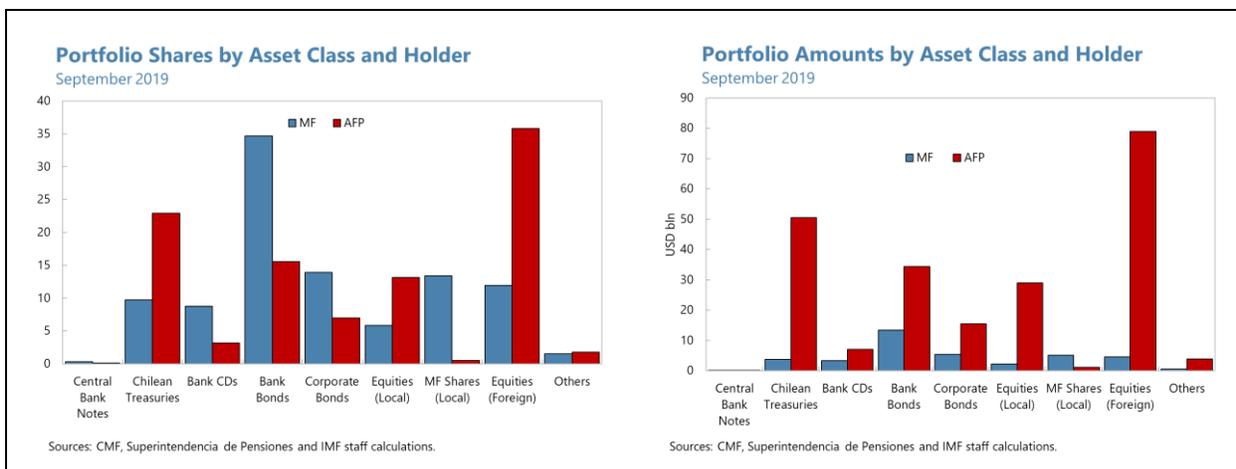
9. AFPs feature prominently in almost all asset classes. AFPs have been the main providers of liquidity for long-term sovereign bonds, bank bonds, corporate bonds, and stocks. Noticeably, AFPs have been by far the major domestic holders of local equities. As such, their role has been instrumental for the size of these markets.

10. Compared to MFs, AFP investment portfolios tend to hold more equities. AFPs hold about 50 percent of their portfolio in equities, more than double the share of equities held by MFs. In contrast, MFs hold larger shares of corporate and bank bonds compared to AFPs, even though the amounts are much smaller. The investment has been concentrated in natural resources, services, and electricity.⁴

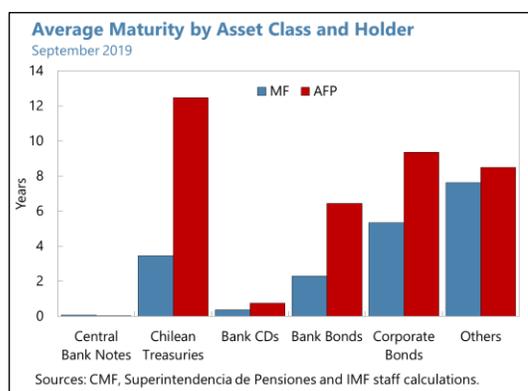


³ OECD (2011).

⁴ Superintendencia de Pensiones (2022).

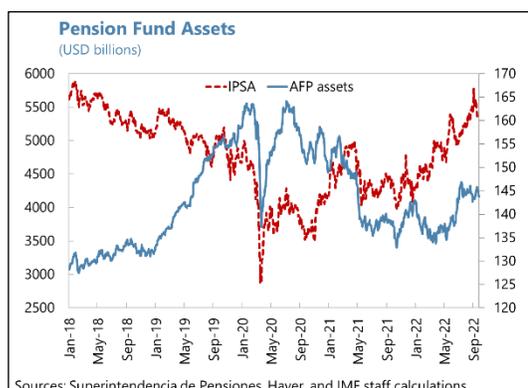


11. AFP investment strategies have favored long-term instruments, but also buy-and-hold. The average maturity of assets held by AFPs is longer than those held by MFs across all asset classes, particularly for sovereign bonds. Moreover, in contrast to AFPs, banks typically invest more short-term, due to regulatory restrictions that require banks to invest more in liquid assets. On the other hand, AFPs tend to buy and hold, hence do not provide much short-term liquidity to capital markets.

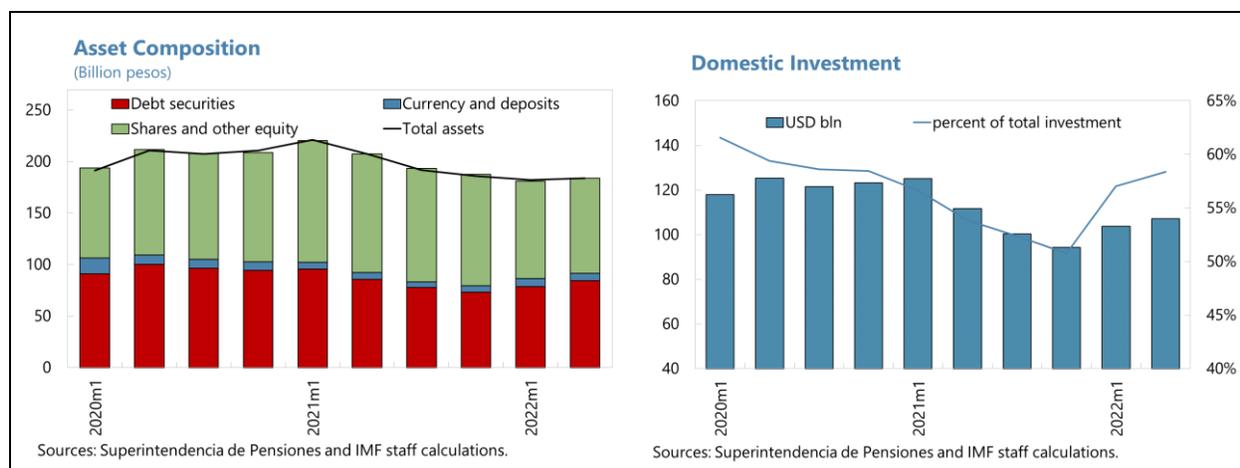


The Impact of Pension Withdrawals

12. After the pension withdrawals, pension fund assets declined significantly. The Chilean Congress approved three rounds of withdrawals (in June 2020, December 2020, and April 2021), which resulted in the withdrawal of more than US\$48 billion from pension funds, equivalent to 23 percent of 2020 total assets or nearly 20 percent of 2020 GDP. The recovery of the stock market and the appreciation of the peso that followed after the peak of the COVID-19 crisis generated favorable valuation effects and helped to partly rebuild pension assets.



13. Most of the reduction in assets took place in debt securities and currency and deposits. At the time of the pension withdrawals, AFPs were highly liquid, in a context of high uncertainty and excessive fund switching. In addition, the introduction of liquidity facilities by the BCCCh allowed the AFPs to carry out a more orderly asset liquidation process during the massive liquidation of assets for the pension withdrawals. Overall, AFPs reduced their domestic exposure, both in USD and as a share of total investment, mostly driven by a reduction in domestic deposits.

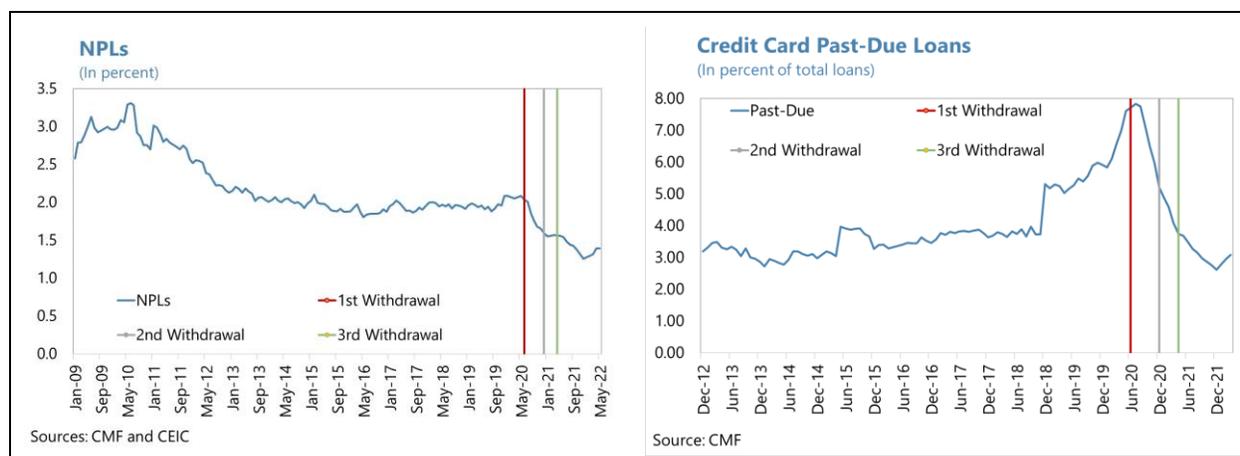


14. As a result of pension withdrawals, households' net financial assets decreased, despite their stable income. Households' gross disposable income remained above pre-pandemic levels, both in nominal terms and as share of GDP, buoyed by ample fiscal transfers. Nevertheless, net financial assets decreased during this period. In particular, pension fund savings went from 77 percent of GDP in 2020Q1 to 63 percent of GDP in 2021Q3.

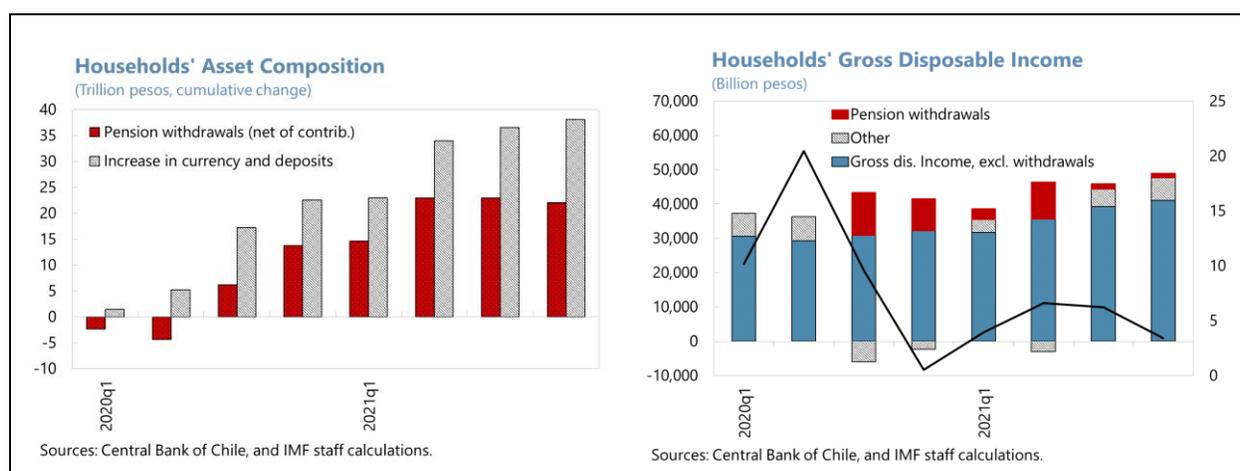
15. Households used part of the pension withdrawals for repaying loans and replenishing cash deposits. A large part of the increased liquidity due to the pension withdrawals was stored in deposit accounts, which increased significantly between 2020Q1 and 2021Q3. However, following the pension withdrawals, households also repaid some of their debt: after spiking during the first months of the COVID-19 crisis, credit card past-due loans decreased below pre-pandemic levels, and non-performing loan rates (NPLs) reached historical lows. In aggregate terms, liquidity that remained in the country was transferred to banks' balance sheets, either via repayment of loans or stored in demand and term deposit accounts.

Households Balance Sheet (percent of GDP)			
	2020Q1	2021Q3	2022Q2
Outstanding financial assets	188.2	178.8	167.9
Currency and deposits	24.7	36.5	31.9
Shares and other equity	64.4	58.6	56.1
Pension funds	76.8	63.4	59.5
Life insurance entitleme	20.8	18.6	18.5
Outstanding liabilities	51.4	47.3	47.5
Net financial assets	136.8	131.5	120.4
Gross disposable income	15.5	17.8	14.6

Sources: Central Bank of Chile, and IMF staff calculations.



16. Households displayed a high propensity to consume out of pension withdrawals. The withdrawal from pension funds were coupled with a corresponding increase in currency and deposits. However, the average saving rate decreased significantly in the second half of 2020, in correspondence with the first two withdrawals, despite gross disposable income remaining relatively stable. Households did not substitute mandatory savings with voluntary savings, as the total saving rate declined. The saving rate turned negative in 2022Q3, as households continued to reduce their deposit balances.



17. The availability of long-term financing for the government and corporate sectors declined. AFPs have been major buyers of long-term domestic government and corporate bonds, but their role in those markets was diminished by the need to liquidate their assets following pension withdrawals. In 2021, the share of external sovereign debt reached 35 percent, as the government resorted more to external debt to meet financing needs. All these factors have impacted the financing cost for the government and corporates.

18. On the stock market, the impact of pension withdrawals likely depended on the exposure of the company to the risk of pension fund liquidations. Stock prices increased and the stock market rallied since the second half of 2020, given the expected consumption boost from

the COVID-19 related stimulus and the withdrawals. However, the impact of pension withdrawals on equities was likely heterogeneous depending on the exposure to the risk of liquidation of pension fund assets. Hence, stocks in the pension funds' portfolios would be expected to reflect the risk of liquidation in their prices more than stocks not included in pension funds' portfolios, on top of the aggregate effect of withdrawals on the economy. Moreover, the liquidation risk from pension withdrawals would be expected to be directly proportional to the exposure, as measured by the pension fund portfolio holdings relative to the market value of the company.

19. To test this hypothesis, staff estimated a panel regression of stock prices on several indicators, including company-specific exposures to pension funds. To estimate the impact of pension withdrawals on the stock market, staff compared abnormal returns around the period of the approval of the three pension withdrawals for companies exposed to pension funds versus companies not exposed to pension funds. The sample consisted of daily returns for all companies listed in the Santiago Stock Exchange between 2018 and 2022. Abnormal returns were estimated assuming a firm-specific beta coefficient and a common elasticity of the returns to the pension fund exposure.

$$r_{i,t} = \beta_{i,t}r_t + \gamma PF_{i,t-31} + \delta_t + \eta_t PF_{i,t-31} + e_{it},$$

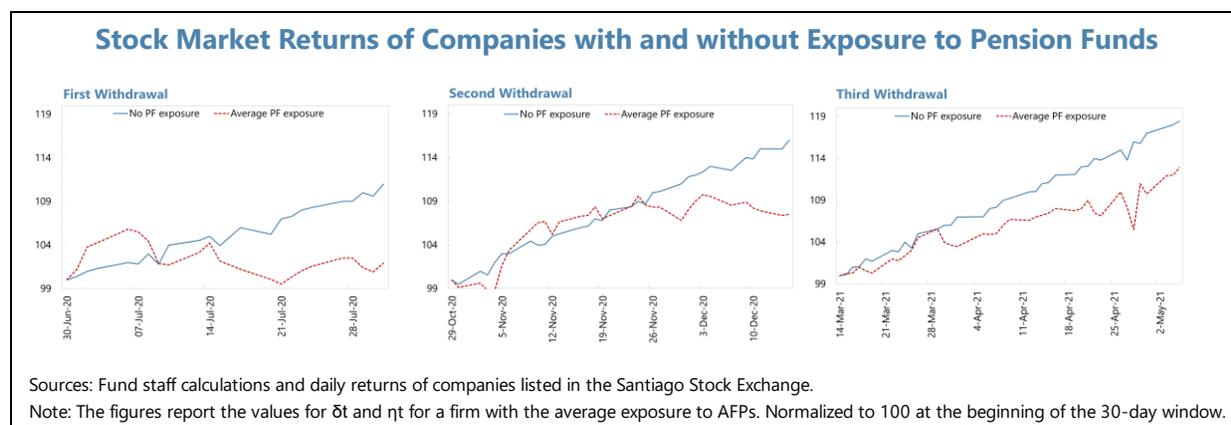
Where:

- $r_{i,t}$ are daily returns for company i , and r_t are average daily returns for the Santiago Stock Exchange;
- $PF_{i,t-31}$ measures the exposure of company i to pension funds as the share of stocks held on pension fund portfolios the month earlier;
- δ_t are daily fixed effects in a 30-day window around the approval of the three pension withdrawals;
- η_t are daily fixed effects interacted with the exposure to pension funds; and
- e_{it} is an error term.

20. The analysis captures the impact withdrawals on the most affected companies relative to the rest of the stock market rather than general equilibrium effects.⁵ Moreover, given that the withdrawals were discussed publicly at length before the approval in Congress, it is hard to pinpoint exactly the time in which the news of pension withdrawals was reflected in stock prices. However, the identification strategy does not rely on timing, like event studies do, but on the

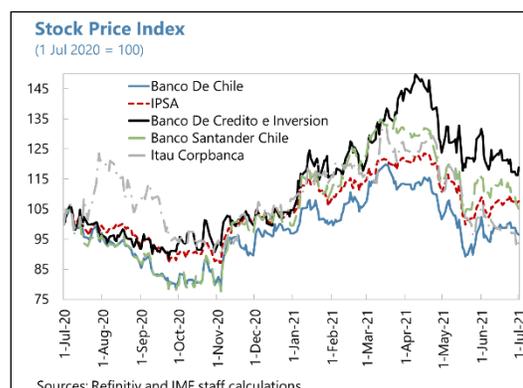
⁵ Many confounding factors pose a challenge to the identification of the full effect that the pension withdrawals had on the economy, including the presence of two shocks, the 2019 social unrest and the pandemic, which hit the country in close succession. Moreover, the period in which pension withdrawals were approved by Congress is characterized by the deployment of fiscal stimulus and monetary policy easing, amid uncertainty around the evolution of the pandemic.

assumption that companies exposed to pension funds and those not exposed to pension funds shared similar features and were affected by other policies and economic shocks in the same way during this period, differing only on their pension fund exposure.



21. Companies exposed to pension funds saw a larger decrease in their stock prices due to the expectation of liquidation of pension fund portfolio holdings. On average, movements in the stock market were not unusually large, either negative or positive. However, stocks held by pension funds performed worse than stocks not held by pension funds, which suggest an increased cost of capital and reduced liquidity for those companies relative to the rest of the stock market. The negative impact of the pension withdrawals seemed also proportional to the exposure to the pension funds: restricting the sample to only companies on the pension fund portfolios, companies with more exposure experienced larger declines in their stock values than companies with less exposure.

22. The impact on banks' stocks seemed muted. The pension funds invested in all major banks in Chile. There is no clear evidence of negative performance of their stock prices when compared with the aggregate stock market index, in contrast to the experience of other companies exposed to pension funds. As a matter of fact, while pension funds were liquidating bank stocks and bonds to accommodate the pension withdrawals, banks also saw increased funding via increased deposits. Moreover, the BCCh provided extraordinary liquidity facilities, reducing the need for banks to resort to the wholesale market. As a result, the impact of pension withdrawals on banks' availability of liquidity was muted. However, banks shifted the type of liabilities to more short-term funding, cut long-term lending, and started lending more at variable rates.



23. The performance of pension funds as a natural offset of non-resident capital outflows weakened. Pension fund investment rules dictate strict limits on foreign investment. As a result, in

response to exchange rate movements, pension funds need to rebalance their portfolios. Hence, pension funds act as shock absorbers, and this function is proportional to the transaction volume that needs to take place, and ultimately the size of pension fund assets. As the size of pension fund assets declined with the withdrawals, the performance of pension funds as natural shock absorbers also weakened (IMF, 2021b).

24. The speed of adjustment was also important. Congress approved the withdrawal of about 10 percent of the outstanding pension fund assets in each of the episodes. The timely fulfillment of the withdrawal requests required AFPs to quickly liquidate large volumes of assets. While the BCCh appropriately intervened to provide liquidity and avoid disruptions, the withdrawals required a fast adjustment to the pension fund portfolios with consequences for their returns.

D. Possible Avenues to Further Deepen Capital Markets

25. More pension withdrawals should be avoided. Additional pension withdrawals would further weaken the pension system, raise fiscal costs, and undermine the depth of the domestic capital market its capacity to absorb shocks. Further withdrawals would pose a systemic liquidity risk, especially given the uncertain environment and the decline in the number of buyers for long-term assets.

26. Pension reform should first and foremost focus on improving pension outcomes. Pension reform remains a priority to deliver on better pensions and redistribution goals. While the introduction of the universal basic pension has virtually eliminated risks of old-age poverty, addressing the low contribution rate, weak contribution density, and a retirement age that has not kept up with life expectancy remains critical to improve inadequate replacement rates and pension outcomes (IMF, 2021a).

27. Pension reform should also consider the capital market and macroeconomic implications. Pension reform should seek to rapidly replenish savings and foster sound investment. International experience suggests that individual capitalization accounts provide stronger incentives to save than notional accounts or pay-as-you-go systems, and are less likely to result in fiscal imbalances. Sound investment rules, adequate regulation on risk and asset management, and a level playing field among investment managers (either public or private) are also key to foster an efficient allocation of savings and avoid excessive risk taking.

28. There is scope to improve the current pension system. In particular, pension regulations and investment options can further promote financial stability and long-term investment. The risk-based supervision model of the pension supervisor can be enhanced, including by streamlining compliance-based oversight to allow the pension supervisor to focus on riskiest entities and activities (IMF, 2021b, and World Bank, 2021).

29. Other avenues that would also support the development of capital markets include:

- **Establishing a repo market.** The 2021 FSAP recommended to set appropriate risk/reward and regulatory incentives to develop this market.⁶ This would alleviate the BCCh's burden to backstop banks' liquidity needs and support the efficient allocation of capital in both financial and non-financial firms. The pricing information that the repo market creates is crucial for a primary dealer system. These reforms will increase liquidity in the market and might have secondary positive effects on the depth of the capital markets.
- **Establishing a Primary Dealers System.** Given that pension funds have been the largest buyers of sovereign bonds, their drop in size has made a dent on market liquidity. A system of primary dealers for sovereign bonds could help fill the gap, while enhancing transparency and increasing financial resilience. It would require the government's guarantee of the availability of sovereign bonds, the development of the electronic platform, and clear transparency principles.
- **Fostering the internationalization of the Chilean peso.** Streamlining administrative process and removing obstacles for foreign investors could expediate the broader use of the Chilean peso in the financial market.⁷ The internalization of the Chilean peso is another avenue to attract more investors, promote their operation in Chile, and mitigate exchange rate risk for bond issuers.
- **Supporting the depth and liquidity of the equity market.** Compared to other emerging market economies, IPO numbers in Chile are low due to the high reliance on bank lending. The high cost of equity due to the illiquidity and ownership concentration leave institutional investors with limited investment options,⁸ leading to less competition and fewer opportunities for exit from the investment. Incorporating flexibility and proportionality in the legal framework would attract smaller, growing firms to the equity market. The authorities could also consider relaxing some investment restrictions on institutional investors, especially pension funds,⁹ while safeguarding consumer protection and financial stability. Promoting venture investment, crowdfunding,¹⁰ or minibonds could also attract investors, especially retail investors, to the capital market.
- **Promoting financial inclusion by harnessing the benefits from fintech.** Financial innovation can enhance access to financial services, thus broadening the scope of financial markets. The

⁶ A draft Financial Market Resilience Bill, recently submitted to Congress, aims to strengthen the legal framework of repo operations. Also, the Financial Stability Council (CEF) agreed to activate the Repo group to identify obstacles that have impeded the development of the repo market.

⁷ The draft Resilience Bill also includes a simplified procedure for obtaining a Single Tax ID for financial operations in Chilean peso.

⁸ IMF (2016).

⁹ OECD (2019).

¹⁰ A Fintech Law, approved by Congress in October 2022, established the legal and regulatory framework for crowdfunding. See details in Annex VII of the Staff Report for the 2022 Article IV Consultation.

recently approved Fintech Law¹¹ has established the legal framework applicable to FinTech companies in Chile. As the Law is implemented, the competition between new Fintech companies and incumbent financial institutions can enhance the efficiency of the financial market and attract more capital to the Chilean economy.

E. Conclusion

30. Pension funds are unique players in Chilean capital markets, providing liquidity to sectors where other players are more reliant to invest. Pension fund investment strategies differ from that of other players, which has translated into large investment shares in key markets, most notably long-term financing and the corporate sector. While the experience from other countries indicates that there are many possible pathways for developing capital markets, pension funds serve an important role in Chile, which is not easily replaced by other investors. Hence, it will remain important to monitor the availability of liquidity in key markets.

31. Pension withdrawals reduced pension benefits, lowered savings, and hurt the depth and liquidity of the domestic capital market. Pension withdrawals resulted in lower pensions and higher fiscal costs, heightening the urgency of pension reform. The withdrawals also had wide ranging macroeconomic consequences. Households displayed a large propensity to consume, which favored a very fast recovery from the pandemic, but also worsened the external position and increased inflationary pressures. Moreover, the withdrawals weakened capital markets and reduced the availability of long-term finance.

32. An active agenda should seek to further deepen capital markets. Pension reform should focus first and foremost on improving pension outcomes. When considering alternatives, pension reform should also be mindful of the capital market and macroeconomic implications, including the timely need to replenish savings and channel resources to productive investment. Other avenues for deepening capital markets, complementing the role of pension funds, should also be considered.

¹¹ See Annex VII of the Staff Report for the 2022 Article IV Consultation.

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CLIMATE POLICIES FOR A SUCCESSFUL GREEN TRANSITION¹

A. Introduction

1. Chile has a comprehensive and ambitious climate strategy. Chile has been an early adopter of climate change policies for adaptation and mitigation, tracing back to the Kyoto Protocol of 1994. More recently, Chile has made important climate commitments, such as updating in 2020 its Nationally Determined Contribution (NDC) target to reduce carbon dioxide (CO₂) emissions by up to 45 percent by 2030 from 2016 levels and reach carbon neutrality before 2050. In November 2022, Chile further updated its NDC at the COP27, expanding its ecosystem protection by 2030 and committing to reverting the growing trend of methane emission by 2025.² As part of its climate strategy, Chile introduced a US\$5 tax per ton of CO₂ in 2014, making it the first Latin American country to introduce green taxes on CO₂ emissions and local pollutants. Chile was also a pioneer in green financing, becoming the first country in the region to issue green bonds in 2019, and in the same year announcing the decommissioning of coal-fired power plants by 2040. Chile continued to enhance its climate strategy by approving the Framework Law on Climate Change in June 2022 and started work on a Green Taxonomy to help private investment in mitigation and adaptation projects.

2. A higher carbon price would be an effective tool to deliver on Chile's climate goals. To reach its 2030 NDC target, Chile will need to increase its carbon capturing or reduce emissions. A higher carbon price, which Chile already has experience with, would help to reduce emissions, green the energy sector, and accrue revenue for the fiscal sector. If the revenue from the higher carbon price is prudently recycled, it can be progressive, benefitting the poorest in society, and positively add to GDP growth in the long term.

3. Now is the time to act, although mitigation risks need to be managed. Acting now and gradually increasing the carbon price over several years would dampen any potential economic costs and transition risks. The increase in the carbon price should be balanced with the current elevated global prices of fuels. As fuel prices fall, Chile can use the opportunity to raise its carbon tax and excise duty on diesel, helping stabilize fuel prices. The economic cost of the rise in the price of nonfuel goods, an indirect effect of increasing the carbon price, which impacts the poorest in society, could be offset through higher spending on health, education, and infrastructure, as well as targeted transfers, financed from the higher carbon price revenue received.

4. Chile should also act now to benefit from the global green transition. The global green transition will likely entail rising demand and prices of lithium and copper and would positively benefit Chile as a leading exporter. Chile also has plans to become the lowest-cost green hydrogen

¹ Prepared By Christopher Evans (RES) and Karlygash Zhunussova (FAD)

² In November 2022, Chile also launched the Natural Capital Committee, a body integrated by the Ministry of the Environment, the Ministry of Finance, and the Ministry of the Economy, to advise and provide recommendations for the measurement of natural assets in Chile.

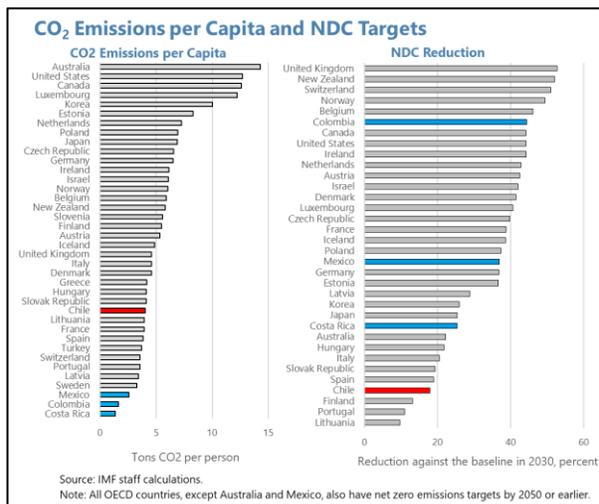
producer by 2030 and one of the largest exporters by 2040, which would help to diversify its exports.

5. This paper presents simulations based on the Climate Policy Assessment Tool (CPAT) developed by the IMF and the World Bank. CPAT is a spreadsheet model that projects, on a country-by-country basis for 175 countries, fossil fuel CO₂ emissions, as well as the emissions, fiscal, economic, energy price, public health and distributional implications of carbon pricing and other commonly used mitigation instruments (Black et al., 2021). This work focuses solely on the impact of carbon pricing on emissions and the macroeconomy. Alternative carbon mitigation tools, which could form the basis of a broader climate strategy, are outside the scope of this analysis.

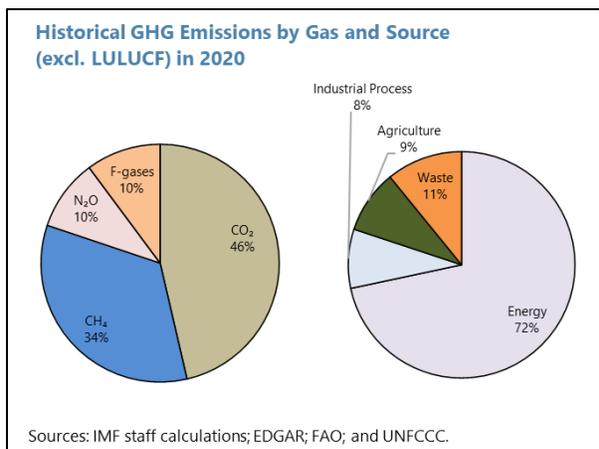
6. The rest of the paper is organized as follows. Section 2 outlines Chile’s current mitigation and adaptation landscape, comparing Chile’s emissions to OECD countries. Section 3 details Chile’s climate strategy. Section 4 analyses the economic benefits of increasing the carbon price. Section 5 explores Chile’s opportunities from the global green transition and then Section 6 concludes.

B. Where Does Chile Stand

7. Chile is a relatively low emitter among OECD countries but has less ambitious NDC emission targets. GHG emission per capita is low for Chile. However, the country is still the largest Latin America emitter in the OECD. Chile has relatively low ambitious NDC targets by OECD standards, with targets below that of other countries in the region (Colombia and Mexico) despite its higher emissions.



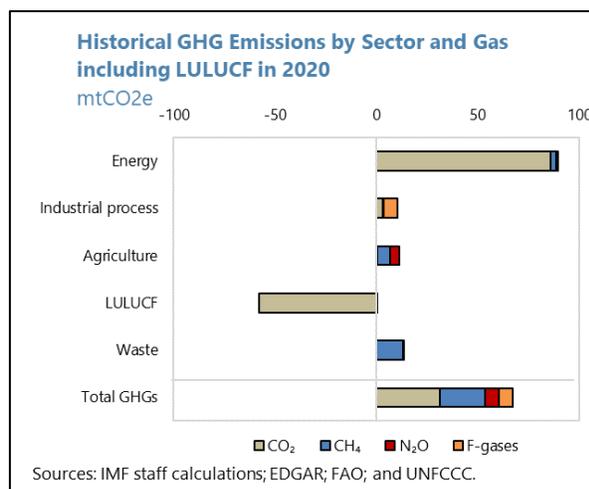
8. Chile’s energy sector accounts for three-quarters of total emissions. Electricity generation and transport account for the two largest shares. Coal and diesel are the two fuels emitting the most (coal for electricity generation in power plants and diesel for transport). However, there are signs that electricity generation is becoming cleaner. In June 2021, EIG Global Energy Partners inaugurated *Cerro Dominador*, the first concentrated solar plant in Latin America, as part of Chile's national renewable energy program (NCRE). Another solar project (PV Almagro Sur) in Atacama,



northern Chile, and a wind farm (Parque Eólico Caman) in Valdivia, southern Chile, are under construction. Moreover, Chile plans to phase-out electricity generation from coal by 2040.³

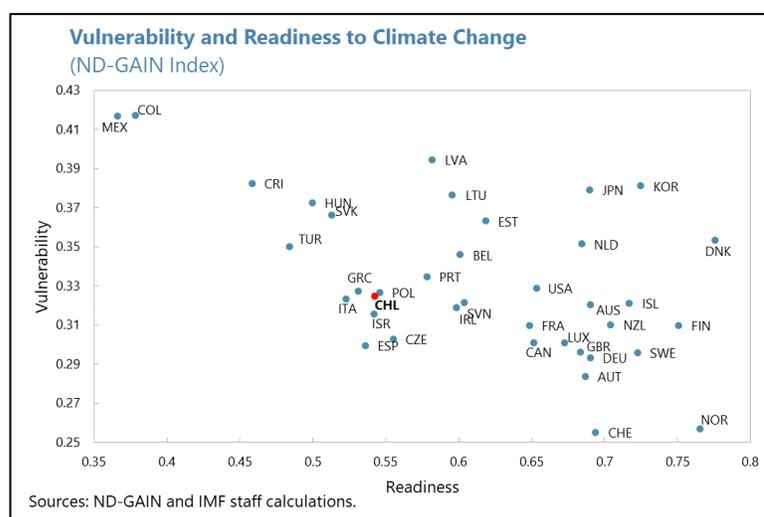
9. Land use, land-use change, and forestry (LULUCF) act as an essential carbon sink, dampening total emissions.

Over the last 20 years, Chile's LULUCF absorbed, on average, around two-thirds of total emissions. According to Chile's National Greenhouse Gas Inventory, LULUCF is the only sector currently acting as a carbon sink (Ministry of the Environment, 2020), with LULUCF carbon capture primarily made up of native forests (Lara et al., 2019). Chile's industrial plantations, in contrast, act as a net carbon source due to the clear-cut harvesting that occurs for the production of short-lived goods, the burning of firewood, and occurrence of wildfires (Johnston and Radeloff, 2019, and Ministry of the Environment, 2020). In 2017, when the forest lands, crop lands, and grasslands were devastated by wildfires, the sector temporarily changed from a carbon sink to a net GHG emission source. Due to the uncertain nature of the long-term carbon capture capacity of native forests and risk of forest fires, Chile must diversify its carbon sequestration capacity without compromising the ecological functionality of biodiverse ecosystems (Hoyos-Santillan et al., 2021).



10. Among OECD countries, Chile ranks within the bottom third on readiness to climate change.

According to the ND-GAIN index, which measures vulnerability (the exposure to climate change) and readiness (the ability to leverage investments and convert them into adaptation actions), Chile ranks within the bottom third for readiness. Although Chile is less vulnerable to climate change and more prepared than others in the region, it ranks below the OECD on average. Chile's exposure to more frequent and severe climate change events stems from its susceptibility to droughts, wildfires, floods, and sea level rise. Chile has previously suffered long-term droughts and is currently suffering a water crisis due to a drought that started in 2010.



³ https://energia.gob.cl/sites/default/files/folleto_estrategia_desc_eng_30102020.pdf

C. Chile's Climate Strategy

11. Chile has been an early adopter of climate change policies for adaptation and mitigation. The institutional structure for climate change in Chile can be traced back to the ratification of the United Nations' Framework Convention on Climate Change in 1994, when Chile subscribed to the Kyoto Protocol. Shortly afterwards, in 1996, a Supreme Decree established The National Advisory Committee on the Global Climate, tasked with coordinating local efforts and foreign policy on climate change. In 2006, Chile began transforming the country's multisectoral model (in which environmental matters were coordinated by the National Environmental Commission (CONAMA)) into a centralized model under the Ministry of the Environment established in 2010. During this period, CONAMA introduced the National Climate Change action plan for 2008-2012 to fulfill Chile's National Climate Change Strategy. The strategy included three main focal areas: adaptation, mitigation, and the creation and promotion of national capacities. A new National Climate Change Action Plan 2017-2022 was introduced to tackle the goals set out in Chile's National Strategy of Climate Change and Vegetation Resources 2017-2022. Chile is also a member of The Coalition of Finance Ministers for Climate Action—a group of over 75 countries aimed at leading the global climate response.

12. The country has committed itself to carbon neutrality by 2050 and to shut down all coal-fired power plants at the latest by 2040. The Government of Chile, in its updated NDC of 2020 submitted under the Paris Agreement, pledged to achieve carbon neutral by 2050.⁴ The target is aligned with the international efforts required to halt the global average temperature increase of between 1.5°C and 2°C (IPCCC, 2022). As part of this pledge, the government committed in 2019 to close all of Chile's coal-fired power plants by 2040, and more recently in July 2021, announced that 65 percent of all coal-fired power plants will be retired by 2025. The updated NDC of 2020 also sets an emission reduction target maintaining GHG emissions below 95 MtCO_{2e} by 2030, defining 2025 as the deadline for peak emissions, and maintaining the GHG emissions budget below 1,100 MtCO_{2e} for the period 2020-30. The updated NDC also incorporates components on oceans, forests, peat bogs and ecosystems, as well as a social pillar on a *just transition* and sustainable development goals, which consider criteria such as gender equity and equality, water safety, and nature-based solutions. In November 2022, Chile presented a further update to their NDC at the COP27, further committing to expand the current area of official protection of terrestrial and aquatic ecosystems by 2030 and revert the growing trend of methane emissions by 2025.

13. Chile continues to enhance its climate strategy, publishing the Framework Law on Climate Change in June 2022. The Climate Change Framework Law (Law 21.455) outlines Chile's climate change goals set out in its updated NDC of 2020, Long-Term Climate Strategy, Climate Change Financial Strategy, and the national, regional, and local climate policies to achieve them. This law partly reverses the centralized approach taken by the Ministry of Environment to assign climate change action to all governmental entities, creating a multi-sector response once again to the climate crisis. Moreover, the law defines a system that could establish GHG emission limits for

⁴ Chile presented its updated NDC to the UNFCCC in April 2020.

regulated entities, laying the foundation for the potential introduction of an emission trading scheme. Additionally, Chile has started work on a Green Taxonomy to further foster private investment in mitigation and adaptation projects.

14. Chile's climate strategy has been bolstered by its successful green financial issuances.

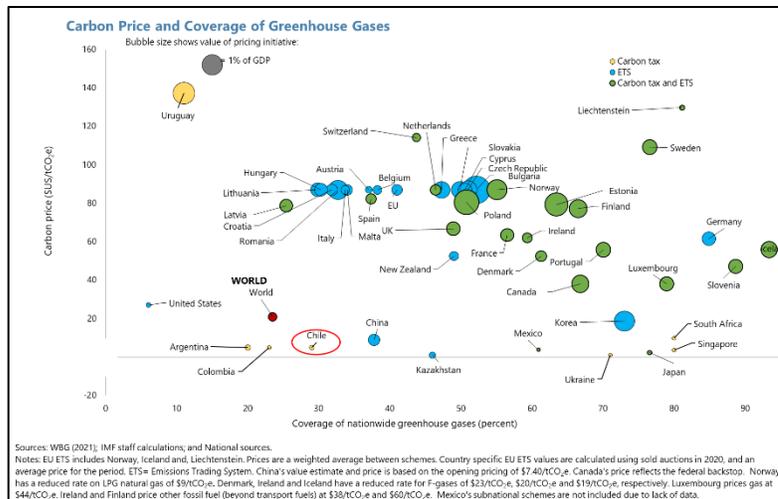
Chile is a leader in the region issuing green and ESG bonds under its Green Bond Framework of 2019 and subsequently the Sustainable Bond Framework (2020) and SLB Framework (2022). Chile became the first country in the Americas to issue a green bond in 2019, issuing €861 million and US\$1.4 billion to finance projects dedicated to infrastructure for electrified public transport (trains, buses); solar projects; energy efficiency; renewable energy; water management and green buildings. Chile has continued to successfully issue ESG bonds, which form around 30 percent of its stock. In 2022 Chile became the first country to issue a Sustainability Linked Bond (SLB), of US\$2 billion, that matures in 2042. The funds raised from the SLB are tied to sustainability performance targets, such as achieving annual GHG emissions of 95 MtCO₂e by 2030, one of Chile's NDC goals. Additional sustainability performance targets include the goal to achieve a maximum GHG budget of 1,100 MtCO₂e between 2020 and 2030 and achieve 60 percent electricity generation derived from non-conventional renewable sources by 2032.

D. The Economic Benefits of a Gradual Increase in the Carbon Price

15. Chile is one of the few LAC countries that implemented a carbon tax, but the tax rate has remained low.⁵ In 2014, Chile introduced a tax reform (Law 20.780) on carbon dioxide that

implemented a US\$5 carbon tax starting in 2017 that has remained at this level since then.⁶ The tax levies atmospheric emissions of local pollutants (PM, NO_x and SO₂) and the main global pollutant (CO₂) from all those establishments that own boilers and/or turbines that together add up to a thermal power greater than or equal to 50 MWT (thermal megawatts). Each global source pays US\$5 per ton of CO₂ emitted, except for those whose

primary source of energy is biomass. The tax has lower coverage (30 percent) and price than the majority of the equivalent policies in OECD countries. However, Chile's tax is on par with other countries in the region (Argentina and Colombia) that have introduced a carbon tax and is close to the world average (Parry et al., 2022).



⁵ See Box 1 for a detailed description of Chile's green taxes.

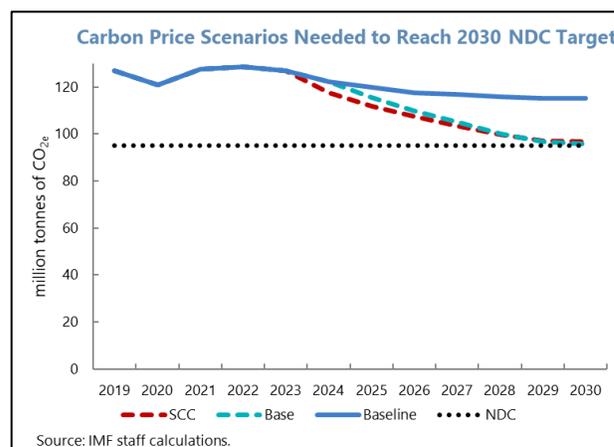
⁶ At the same time, Chile introduced a green tax on the sales of new light-duty vehicles based on fuel efficiency and nitrogen oxides (NO_x) emissions. See Box 1 for more details.

16. There is scope to gradually increase the carbon tax, expanding the coverage and raising the price, yet transition risks need to be managed. A gradual rise in the carbon price should be balanced with the current higher-than-usual energy prices. To limit upward pressure on prices, an increase in carbon taxes should be measured. It is critical to act now by gradually increasing the carbon price and balancing this with the subsiding of geopolitical tensions that are currently putting upward pressure on oil and gas prices. Further, revenue generated from a higher tax could be recycled to dampen the short term costs and serve as a tool for income redistribution to low-income households.

Impact of Higher Carbon Price on Emissions

17. This section relies on CPAT to assess the impact of an increase in the carbon tax, combined with other policies, on emissions and the economy. CPAT is a spreadsheet model developed jointly by IMF and World Bank staff that projects, on a country-by-country basis for 175 countries, fossil fuel CO₂ emissions, as well as the emissions, fiscal, economic, energy price, public health and distributional implications of carbon pricing and other commonly used mitigation instruments (Black et al., 2021). The tool uses countries' economic data, combined with the use of fossil fuel and other fuels by the power, industrial, transport, and household sectors. Baseline or Business-As-Usual emissions are then projected using GDP forecasts, assumptions about the income elasticity of demand for electricity and other fuel products, the rate of technical progress, and future energy prices. The impact of a higher carbon tax and other mitigation policies on fuel use and emissions are determined by their effect on future energy prices, induced switching of fuels within the power generation sector, and various price elasticities for electricity and fuel use in other sectors.

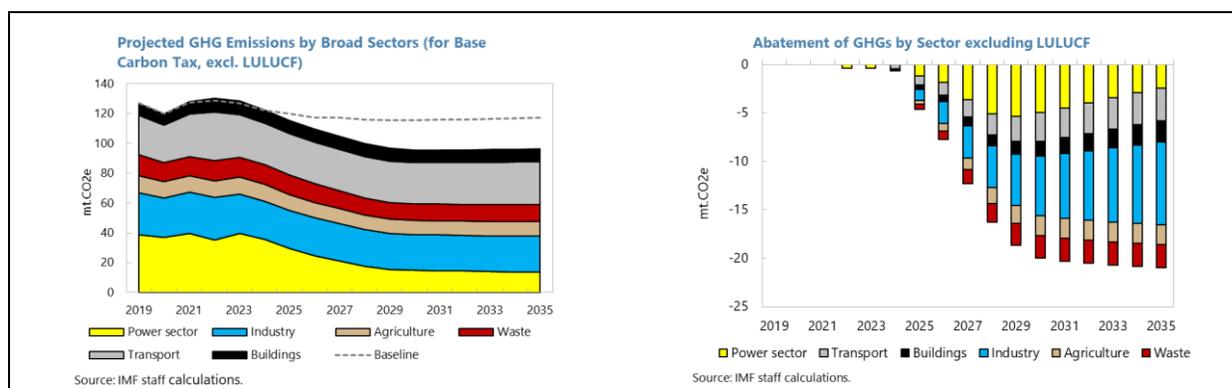
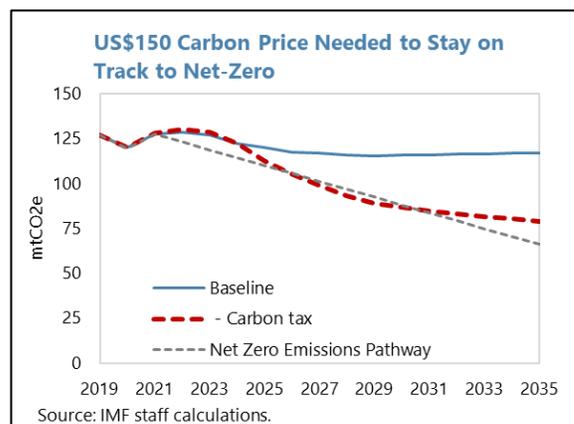
18. A gradual increase of the carbon price should be part of Chile's climate strategy. An increase in the carbon price is the most effective way to meet Chile's NDC emission reduction goal and put Chile on track to reach net-zero emissions by 2050. For instance, a gradual increase in the carbon tax from US\$15 starting in 2024 to US\$60 by 2030, while at the same time increasing the excise on diesel, will help Chile reach its NDC target (Base Scenario).⁷ Alternatively, the 2030 NDC target could also be reached by an increase in the carbon tax alone under the Social Cost of



⁷ The Base Scenario sets the carbon tax at US\$15 per ton of CO₂ in 2024, increasing linearly to US\$60 per ton of CO₂ in 2030. The carbon tax excludes gasoline and diesel, but the excise on diesel is increased to bring the effective carbon rate equal to that of gasoline (starting from US\$0.05/liter in 2024 and increasing linearly to US\$0.37/liter in 2030).

Carbon (SCC)⁸ scenario, which requires a higher initial carbon price of US\$35 in 2024, gradually increasing to US\$75 by 2030.

19. Chile will need to raise its carbon tax to US\$150 and broaden its scope to stay on track to net-zero by 2050. The carbon price will need to reach US\$150 by 2030 if Chile is to stay on track to reach net-zero by 2050. Chile will also need to broaden the scope of the tax to all sectors and fuel types. To keep on this emission reduction path solely through the use of a carbon tax, Chile will need to continue to raise the price of carbon beyond 2030. Alternative emission reduction schemes and carbon capture, which are outside the scope of this analysis, could also be used to reach Chile’s NDC and net-zero goals.⁹



20. Increasing the carbon price and expanding coverage is expected to induce a fall in emissions across a broad range of sectors. If the carbon price is expanded and increased following the Base Scenario (a rise in the carbon tax to US\$60 by 2030 and an increase in the excise on diesel) would foster a fall in emissions across the economy. The power sector, which previously was the most pollutant, would become one of the greenest sectors as renewables become the primary source of energy generation. Falling emissions in the transport and industry sectors would also be expected.

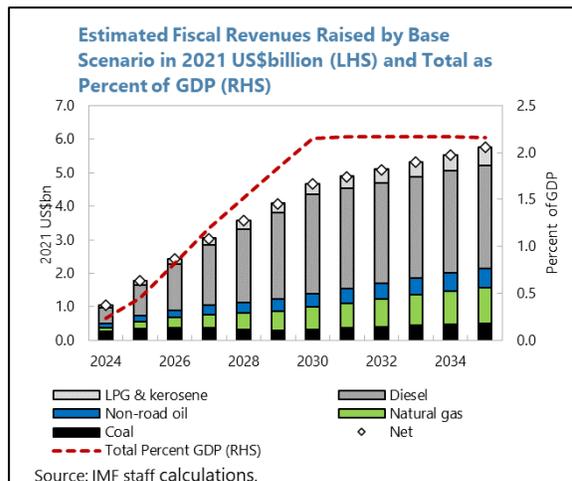
⁸ The SCC scenario sets the economy-wide carbon tax at US\$35 per ton of CO₂ in 2024 and increasing linearly to US\$75 per ton of CO₂ in 2030.

⁹ Proposed carbon pricing scenarios would need to be re-calibrated if used in conjunction with other emission mitigation policies to determine the required carbon price needed to reach Chile’s NDC and net-zero goals.

Revenue Mobilization and Recycling

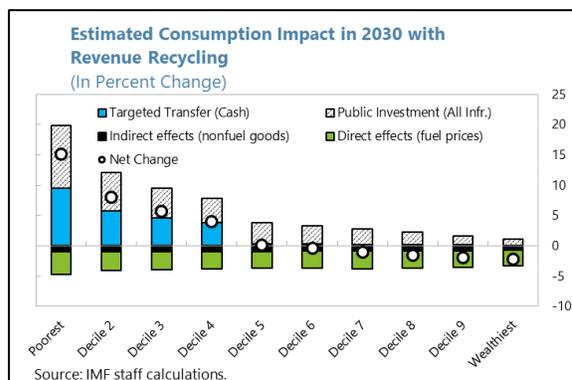
21. Carbon pricing can also be a significant source of revenue, which could amount to US\$5 billion or 2 percent of GDP in revenue by 2030 in the Base Scenario.

If the carbon tax is gradually increased to US\$60, combined with an increase in the excise on diesel by 2030, it could be a significant source of revenue. The higher price on emissions would impact highly pollutant fuels, such as coal, lowering their usage and bringing in revenue. The largest source of revenue from the carbon tax and excise duty is expected through diesel, which is used to fuel most cars in the country. The second largest source of revenue is expected from natural gas.



22. Carbon pricing can be progressive, if revenue is recycled well, benefiting the bottom half of the income distribution.

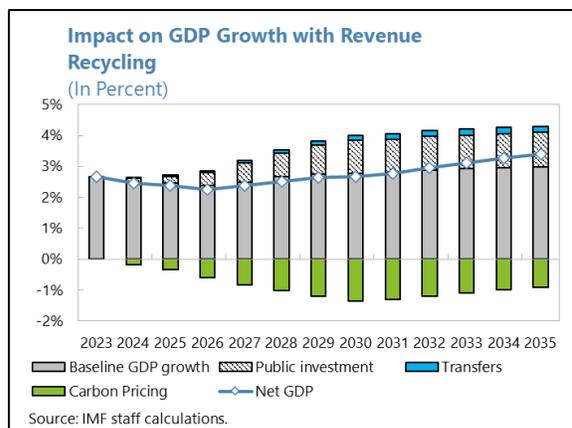
A higher carbon price typically impacts more the richer in society through higher fuel prices (direct effect of a carbon tax and excise duty). However, the poorer in society are also negatively impacted, as they suffer a rise in the price of nonfuel goods (indirect effect). On its own, a higher carbon price would lead to lower consumption across all income deciles.



However, if the revenue is recycled into public investment and targeted transfers, it can become progressive and benefit the poorest. For example, if part of the revenue from the higher carbon price were rebated to the poorest half of society, then the policy would entail a net gain for them.

23. The revenue from a higher carbon price can be recycled to also soften the impact on GDP growth in the short term and boost potential growth for the future.

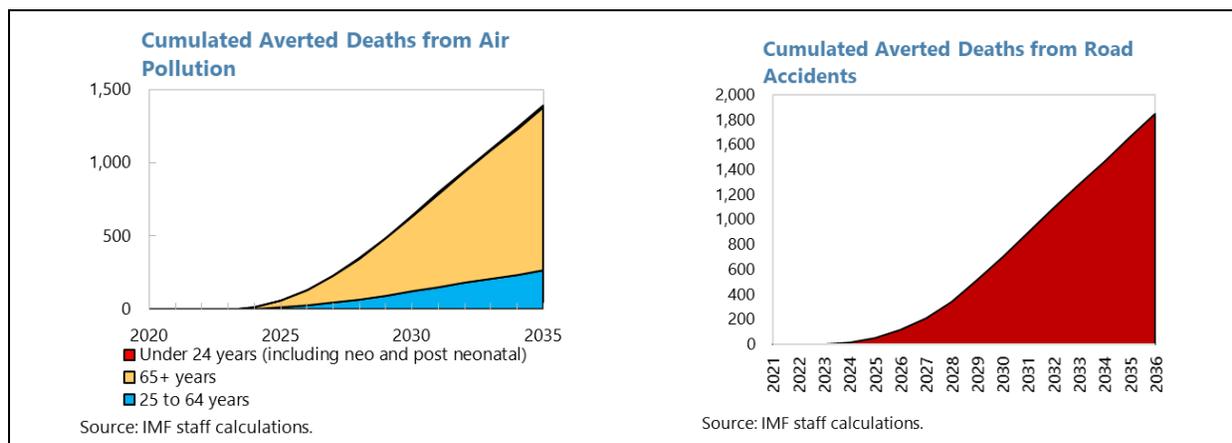
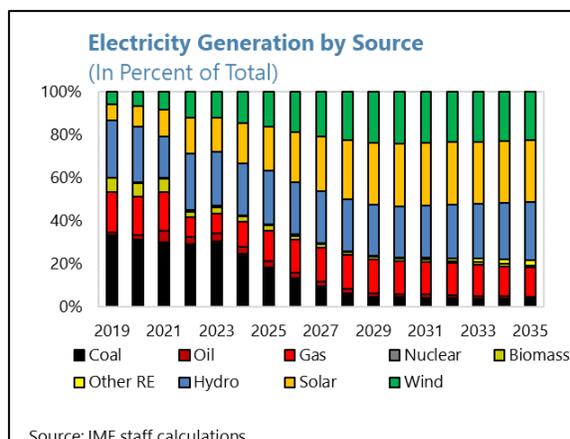
The revenue from implementing a carbon tax and higher excise duty on diesel can be reused to improve growth prospects in the future. For instance, recycling the revenue to public investment projects, such as improvements in public transport and infrastructure investment, will help boost growth. If the revenue is prudently recycled, it can dampen



the negative impact on growth in the short term and help to increase growth after the economy has transitioned to a higher carbon price in the long term.

Broader Benefits of a Higher Carbon Price

24. A higher carbon price will change Chile’s energy matrix, encouraging greater use of renewables. Electricity generation from highly pollutant fuels (coal) is expected to fall, as the user cost of coal rises relatively more than less pollutant sources. The higher carbon price would help reduce the use of coal, and therefore is well aligned with the government’s policy to close half of its coal-fired power plants by 2025 and remove all coal power plants by 2040. The share of electricity generation from renewable energy such as wind, solar, and hydro are expected to increase, as they are less affected by the carbon price and become relatively cheaper as the carbon price rises. If a higher carbon price is introduced, staff simulations show that by 2030 around three quarters of electricity generation in Chile will come from renewables.



25. Improvements in air quality due to falling emissions are also expected to reduce mortality from air pollution. Alongside its economic benefits, a higher carbon price is expected to improve air quality and therefore reduce mortality due to air pollution. In the Base Scenario, more than 1000 deaths due to air pollution are expected to be avoided. A higher carbon price will also increase the price of conventional car use and incentivize public transport use, helping to reduce road accidents.

E. Opportunities from the Global Green Transition

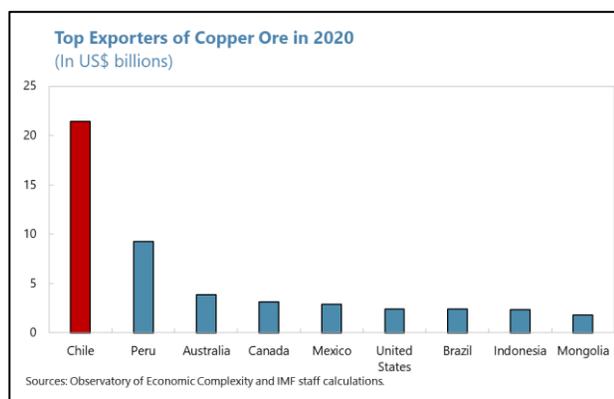
26. Owing to an abundance of lithium and copper, Chile is well positioned to benefit from the global green transition. Under a net-zero global emissions scenario, the global price of lithium is expected to rise several hundred percent from 2020 levels, which combined with higher demand for copper, could increase Chile's export revenues from lithium by a factor of 50 and double copper export revenue (Boer et al., 2021).

- Chile was 2nd in the world in lithium mining in 2021 and has large reserves. Although lithium markets vary by location, batteries are the main use (74 percent) globally and ceramics and glass the second most common use (14 percent). Lithium consumption for batteries has increased significantly in recent years because rechargeable lithium batteries are used extensively in the growing market for portable electronic devices, and increasingly used in electric tools, electric vehicles, and grid storage applications.

	Mine Production	Reserves
Australia	55,000	5,700,000
Chile	26,000	9,200,000
China	14,000	1,500,000
Argentina	6,200	2,200,000
Brazil	1,500	95,000
Zimbabwe	1,200	220,000
Portugal	900	60,000

Sources: U.S. Geological Survey and IMF staff calculations.

- Chile is the world's top copper exporter, which is a key metal for the green transition. Copper is used in many types of green energy (electric vehicles, wind farms, solar, and energy storage). It is estimated that in a net-zero global scenario, copper prices would increase more than 60 percent by 2040 from 2020 levels (Boer et al., 2021). The rise in price and demand for copper would provide significant windfalls to Chile.



27. Chile aims to become a leader in green hydrogen. In November 2020, Chile outlined its plan in the National Strategy for Green Hydrogen to become one of the lowest-cost green hydrogen producers by 2030 and one of the largest exporters by 2040. The Strategy highlights the need to activate the domestic industry, build infrastructure and supply chains, and then scale production and achieve stronger integration in international markets. To this end, in 2021, Chile's state development office (CORFO) pledged US\$50 million in grants to six green hydrogen projects, with an additional three agreements signed in 2022. The hope is that Chile's exports of green hydrogen could rival its copper exports; however, the success of low-cost production will hinge on the expansion of its renewable energy sector.

F. Conclusion

28. A gradual increase in the carbon price would help Chile lower emissions, achieve its climate goals, and boost inclusive growth in the long term. Staff simulations based on CPAT suggest that a gradual increase in the carbon tax to at least US\$60 by 2030, coupled with a higher excise for diesel, would be needed to reach NDC goals. The 2030 NDC target could also be reached by an increase in the carbon tax alone to US\$75 by 2030, while a carbon tax of US\$150 would allow Chile to stay on track to net-zero. These estimates would need to be re-calibrated if combined with complementary measures to curb CO₂ emissions. If the revenue from the higher carbon price is used prudently for productive infrastructure projects, health and education spending, and targeted transfers, it can be a progressive tax that benefits vulnerable households, while boosting growth in the future. Now is the time to act, so that the increase in the carbon price can be gradual and transition costs be minimized.

29. A higher carbon price will help green energy production, which will be vital for the National Strategy for Green Hydrogen. Chile aspires to become one of the lowest-cost green hydrogen producers by 2030 and one of the largest exporters by 2040. An increase in the carbon price, which increases the cost of pollutant fuels and helps to incentivize renewable energy production, could be a crucial component of this goal. Staff estimates that a US\$60 carbon price, a higher excise on diesel, and the planned reduction of coal in electricity usage by over half by 2025, could result in around three quarters of electricity generation in Chile stemming from renewables by 2030. The greening of the energy sector is a vital component of Chile's National Strategy for Green Hydrogen so that it can become the lowest-cost green hydrogen producer and expand its green hydrogen exports. Further, through sizable lithium reserves, and already prominent copper exports, Chile has the opportunity to benefit from a global green transition. An institutional framework for lithium needs to be developed to accelerate growth in the sector to seize the current, and expected, rising global demand and price of lithium.

Box 1. Green Taxes

In 2014, Chile introduced a tax reform bill that included 3 green taxes, which were implemented in 2017. As of 1 January 2017, green (or Pigouvian) taxes came into force in the country. The main objectives are to support and complement efforts to reduce local air pollution and mitigate greenhouse gas emissions. The first tax was on CO₂ emissions from stationary sources with boilers and turbines (sum over 50MW). The second tax was on local contaminants also on stationary sources with boilers and turbines (PM, SO₂ and NO_x), and the third was a tax on the first sale of new cars taking into account the expected NO_x emissions over their lifetime.

The tax on the local pollutant is higher for regions with a larger social cost of pollution. While the tax on the global pollutant is fixed at US\$5 per ton of CO₂, the local pollutant tax (T_{ij}) of pollutant i in municipality j is dependent of the air quality (CCA_j) and population (Pob_j) in the municipality and the social cost of the pollutant ($CSCpc_i$). As shown in the equation below, the tax on the local pollutant is calculated in terms of its marginal costs, such that the tax is higher for particulate matter pollution, which is linked to cardiovascular and respiratory diseases. The local pollutant tax also increases with the population of the municipality (Pob_j) as the social cost of emissions is higher.

$$T_{ij} = 0.1 * CCA_j * CSCpc_i * Pob_j$$

The tax has brought in around US\$200 million each year from 2017-2020. The majority of this is from CO₂ emitted from the energy sector. From the first year of operation, a total of 94 affected establishments, including 303 sources (boilers and turbines), reported their emissions and the tax raised US\$191 million. The CO₂ tax accounted for the largest share of the total (88%), while the local pollutant taxes accounted for the remaining 12% (PM (8%); NO_x (3%); and SO₂ (1%)). The carbon tax has continued to bring in close to US\$200 million each year.

The tax reform law of 2020 updated the scope of the green tax and allows offsets starting in 2023.

With the approval of the tax reform law, Law N° 21.210, in early 2020, modifications were made to the green tax that aim to further generate incentives to reduce emissions. From 2023, the number of establishments that are subject to the tax are expected to increase, as the threshold for taxation changes to sources that are emitting 25,000 tons of CO₂/year or 100 tons of PM/year, regardless of size or characteristics of the technology. Further, the reform introduced the ability to implement projects that reduce pollutants to offset emissions against the green tax.

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